

**IN THE UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF DELAWARE**

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|-----------------------------------|---|-----------------------------|
| ROCEP LUSOL HOLDINGS LIMITED, |) | |
| |) | |
| Plaintiff/Counterclaim Defendant, |) | |
| |) | |
| v. |) | Civil Action No. 05-141-KAJ |
| |) | |
| PERMATEX, INC., and ULTRAMOTIVE |) | |
| CORPORATION, |) | |
| |) | |
| Defendants/Counterclaimants. |) | |

**APPENDIX FOR
PLAINTIFF ROCEP LUSOL HOLDINGS LIMITED'S
BRIEFS IN ANSWER TO DEFENDANTS' OPENING CLAIM CONSTRUCTION
BRIEF AND DEFENDANTS' OPENING SUMMARY JUDGMENT BRIEFS OF
NON-INFRINGEMENT AND INVALIDITY**

Respectfully submitted,

ROCEP LUSOL HOLDINGS LIMITED

DAVID P. PRIMACK (#4449)
Drinker Biddle & Reath LLP
1100 North Market Street, Suite 1000
Wilmington, DE 19801-1254
Tel: 302-467-4224
Fax: 302-467-4201

ROBERT E. CANNUSCIO
Drinker Biddle & Reath LLP
One Logan Square, 18th & Cherry Streets
Philadelphia, PA 19103-6996
Tel: (215) 988-3303
Fax: (215) 988-2757

Attorneys for
ROCEP LUSOL HOLDINGS LIMITED

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| Exhibit A | WO 9918010 |
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EXHIBIT A

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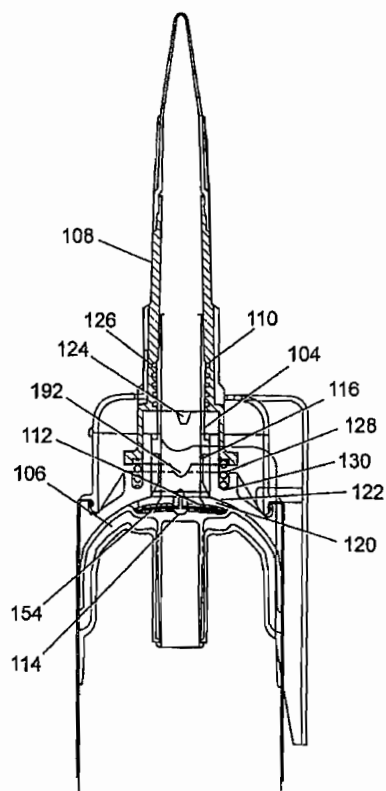
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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

| | | |
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| (51) International Patent Classification ⁶ : B65D 83/16, 83/14 | A2 | (11) International Publication Number: WO 99/18010 (43) International Publication Date: 15 April 1999 (15.04.99) |
| (21) International Application Number: PCT/GB98/03003 (22) International Filing Date: 7 October 1998 (07.10.98) (30) Priority Data: 9721120.5 7 October 1997 (07.10.97) GB 9800825.3 16 January 1998 (16.01.98) GB 9813865.4 27 June 1998 (27.06.98) GB (71) Applicant (for all designated States except US): ROCEP LUSOL HOLDINGS LIMITED [GB/GB]; Rocep Business Park, Kings Inch Road, Deanpark, Renfrew PA4 8XY (GB). (72) Inventor; and (75) Inventor/Applicant (for US only): FRUTIN, Bernard, Derek [GB/GB]; Jaapston Farm, By Uplawmoor, Renfrewshire G78 3BL (GB). (74) Agent: MURGITROYD & COMPANY; 373 Scotland Street, Glasgow G5 8QA (GB). | (81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i> | |

(54) Title: DISPENSING APPARATUS**(57) Abstract**

A dispensing apparatus for dispensing a product from a container under pressure of a propellant by means of a composite piston (138). The apparatus has a valve (104) operated by means of an actuator (108) and a lever (166). The actuator cooperates with the valve and lever by means of a screw thread arrangement (110), such that turning actuator relative to the lever varies the flow rate of product out of the apparatus. The valve is a hollow cylindrical tube (104) which is open at one end and closed at the second end, either permanently or by means of a flap valve (112) which allows insertion of the product. A number of ports (116) are arranged around the circumference of the tube (104) adjacent to the second end to allow product to flow through the valve when the lever is operated. The composite piston (138) comprises a first piston (140a) coupled to a second piston (140b) by mutually engageable central stems (142a, b) and enclosing between the pistons a viscous substance which contacts the inside wall of the container to provide an effective seal. The piston arrangement of the apparatus stays together without the need for "necking in" the can and the apparatus can be filled with product by the manufacturer.



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1 **DISPENSING APPARATUS**

2

3 This invention relates to dispensing apparatus.
4 Particularly, but not exclusively it relates to
5 dispensing apparatus for dispensing viscous materials
6 from a container under pressure of a propellant.

7

8 Known dispensing apparatus commonly includes a valve
9 mechanism fitted to a container which is refilled with
10 a product, for example mastic or sealant, which is to
11 be dispensed. Examples are disclosed in Patent
12 document EP-B-0243393 (Rocep Lusol Holdings Limited).
13 However, known arrangements have several disadvantages.

14

15 For example, the cost of components used in the
16 manufacture of such known apparatus is high. This is
17 particularly true in relation to the cans used as
18 containers in such apparatus. Further, automatic
19 assembly of such apparatus is complicated and costly.

20

21 Yet another disadvantage is that the product must be
22 filled into the dispensing apparatus during manufacture
23 of the apparatus. This involves the product
24 manufacturer supplying the product in bulk to the
25 apparatus manufacturer who then returns the filled

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2

1 apparatus to the product manufacturer for sale. This
2 is costly and inconvenient. As a result of the
3 foregoing, the overall costs associated with presently
4 available dispensing apparatus are high.

5
6 Known dispensing apparatus, such as that disclosed in
7 EP-B-0089971 (Rocep Lusol Holdings Limited), include
8 piston arrangements which are designed to prevent
9 propellant gas in the apparatus from coming into
10 contact with the product to be dispensed. Commonly,
11 these piston arrangements consist of a pair of pistons
12 with sealant therebetween. However, known arrangements
13 can be costly to manufacture and have the significant
14 disadvantage that after filling of the apparatus, and
15 during storage, the sealant expands causing the pistons
16 to separate from one another. This problem has to be
17 addressed by "necking in" the can (ie locally reducing
18 the diameter of the can) below the piston assembly to
19 prevent separation. It would be desirable to have a
20 piston arrangement which would stay together without
21 the need for "necking in" the can.

22
23 It would also be desirable to have dispensing apparatus
24 such that a manufacturer can fill the apparatus with
25 product himself, after the apparatus has been assembled
26 and/or pressurised, and to have dispensing apparatus
27 which is refillable.

28
29 According to a first aspect of the present invention
30 there is provided dispensing apparatus for dispensing a
31 product from a container under pressure of a
32 propellant, said apparatus comprising a product chamber
33 within the container and a valve adjacent to the
34 product chamber characterised in that the valve allows
35 product flow into and out of the product chamber.

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3

1 Preferably, the product chamber is pressurised. The
2 product chamber preferably contains a piston, situated
3 between the propellant and the valve.

4
5 Preferably, the piston is an interlocking double
6 piston. The interlocking sections preferably have a
7 sealant between them. The sealant forms a
8 substantially impenetrable barrier between the
9 propellant and the product.

10

11 Preferably, the valve is operated by means of an
12 actuator and a lever. The lever may be manufactured of
13 plastics material; it may be manufactured as a single
14 piece of plastic, for example by injection moulding.

15

16 Preferably, the actuator and the lever co-operate by
17 means of a screw thread arrangement. Turning of the
18 actuator relative to the lever may vary the flow rate
19 of product out of the apparatus. Turning may be
20 possible from a "lock-off" position, in which the
21 actuator is clicked home, to a fully on position.
22 Markings may be provided to show the flow rate
23 corresponding to predetermined positions on the lever.

24

25 Means may be provided to demonstrate to a user that the
26 actuator is in the closed position, ie the position in
27 which no product can flow. It is further preferred
28 that the actuator is provided with means to limit the
29 travel of the actuator once the fully open position is
30 reached. Said means may also prevent the actuator from
31 being opened too far or being completely removed from
32 the apparatus. Said means may be a groove or
33 substantially axial slot in the external wall of the
34 actuator.

35

36 Preferably, the container is made substantially from

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1 tin plate or aluminium. Most preferably the container
2 is a wall ironed tin plate can. For example, it may be
3 an extruded tin plate can as used in the beverage
4 industry, without a side seam.

5
6 According to a second aspect of the present invention
7 there is provided a composite piston for use in
8 dispensing apparatus, said composite piston comprising
9 a first piston, a second piston and a coupling means,
10 the coupling means movably coupling the first and
11 second pistons to each other and permitting limited
12 relative movement between the first and second pistons
13 in a direction substantially parallel to the direction
14 of movement of the composite piston.

15
16 Preferably the first and second pistons interlock in
17 use defining a piston sealant chamber.

18
19 Preferably the piston sealant chamber is open
20 circumferentially.

21
22 Preferably, the coupling means comprises a projection
23 on one of the first and second pistons and a recess in
24 the other of the first and second pistons, and the
25 projection engages in the recess to couple the pistons
26 to each other.

27
28 Typically, the projection is of a smaller dimension
29 than the recess to permit movement of the projection
30 within the recess to facilitate the limited relative
31 movement of the first and second pistons. Preferably,
32 the projection and the recess include mutually
33 engageable ratchet formations which permit movement of
34 the pistons relative to each other in one direction
35 only. Preferably, the one direction is movement of the
36 pistons towards each other.

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5

1 Typically, the recess is a central aperture in one of
2 the pistons and the projection is a central projection
3 on the other piston arranged to engage the recess.

4

5 Preferably, the first piston and/or the second piston
6 may be elastically distorted to permit a push fit
7 engagement of the projection into the recess.

8

9 Typically, the pistons may be manufactured from a
10 flexible material, such as plastic.

11

12 Preferably, the composite piston also includes a
13 viscous substance which in use contacts the inside wall
14 of a container adjacent the composite piston. The
15 viscous substance may help to facilitate sealing of the
16 composite piston against the inside walls of the
17 container and/or reduce friction between the composite
18 piston and the inside walls of the container.

19

20 Preferably the viscous substance is a sealant, such as
21 a glycerine and starch mixture. Preferably the sealant
22 is adapted to contact the interior surface of the
23 container, thereby forming a seal. This seal may be an
24 annular ring of sealant in contact with the container.
25 This prevents propellant in the apparatus from coming
26 into contact with product in the apparatus.

27

28 One or both of the primary and secondary portions may
29 be provided with an aperture and/or a valve to allow
30 gas to escape out of the sealant chamber in use. Said
31 valve may be a check valve; it may be provided in a
32 stem provided in the centre of the secondary portion.

33

34 Preferably the piston assembly is provided with means
35 for accommodating expansion of the sealant, in use.

36 This may help prevent piston separation. Said means

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1 may be thinned portions provided on the primary and/or
2 secondary piston. Preferably, said means is a
3 plurality of thinned pockets in the wall of the
4 secondary piston. These pockets may balloon to
5 accommodate sealant expansion in use.

6
7 According to a third aspect of the present invention
8 there is provided a container for dispensing a product
9 therefrom, the container comprising a piston according
10 to the second aspect movably mounted within the
11 container and an outlet through which the product is
12 dispensed, the container walls and the composite piston
13 defining a product chamber within the container, and
14 movement of the composite piston within the container
15 towards the outlet expelling product through the
16 outlet.

17
18 Typically, the viscous material is located between the
19 first and second pistons and may be forced into
20 engagement with the inside wall of the container by a
21 compression force which acts between the first and
22 second pistons to cause the second piston to move
23 towards the first piston.

24
25 Preferably, the composite piston also includes a wall
26 engaging skirt which abuts against an inside wall of
27 the container. Preferably, a wall-engaging skirt is
28 provided on both the first and the second pistons.

29
30 Preferably, the container is a pressure pack dispenser
31 which comprises a propellant system which pushes the
32 piston towards the outlet. However, alternatively, the
33 piston could be used in for use in combination with a
34 mechanical actuating device which pushes the composite
35 piston towards the outlet of the container.

36

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1 According to a fourth aspect of the present invention,
2 there is provided a container for use in dispensing
3 apparatus, said container comprising a hollow
4 cylindrical portion and a boss portion, said
5 cylindrical portion being open at one end for
6 attachment of a sealing dome and having a curled in
7 portion at the other end for engagement with a
8 corresponding flange provided on the boss portion.

9
10 Preferably, the cylindrical portion is made
11 substantially from tin plate or aluminium or other
12 suitable material.

13
14 Specific embodiments of the invention will now be
15 described, by way of example only, with reference to
16 the accompanying drawings in which:

17
18 Fig 1 is a side view in cross-section of
19 dispensing apparatus in accordance with an
20 embodiment of the present invention;

21
22 Fig 2 is an enlarged view of the valve area of the
23 apparatus of Fig 1;

24
25 Fig 3 is an enlarged view in cross-section of the
26 valve area of apparatus in accordance with another
27 embodiment of the present invention;

28
29 Fig 4 is an exploded view in perspective of the
30 apparatus of Fig 1 without a piston, nozzle or
31 overlap;

32
33 Fig 5 is a sketch of a lever mechanism for use in
34 the apparatus of Fig 1;

35
36 Fig 6 is a side view in cross-section of the

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1 apparatus of Fig 1 during filling;

2

3 Fig 7 is an enlarged cross-sectional view of the
4 piston crown area of apparatus in accordance with
5 a preferred embodiment of the present invention at
6 the start of a fill cycle;

7

8 Figs 8a-8c are side views in cross-section of the
9 apparatus of Fig 1 during use;

10

11 Fig 9 is a cross-sectional view of the nozzle area
12 of apparatus in accordance with a further
13 embodiment of the present invention, adapted to
14 dispense predetermined doses of a product;

15

16 Fig 10 is a view in cross-section of a primary
17 piston of a piston assembly in accordance with the
18 present invention;

19

20 Fig 11 is a view in cross-section of a secondary
21 piston which cooperates with the primary piston of
22 Fig 10;

23

24 Fig 12 is a plan view of the top part of the wall
25 of the piston of Fig 11, showing the relative
26 thickness of each part of the wall;

27

28 Fig 13 is a side view in cross-section of
29 apparatus in accordance with yet a further
30 embodiment of the present invention, suitable for
31 "backward" filling;

32

33 Fig 14 is a cross-sectional view through a
34 container showing a composite piston in accordance
35 with another embodiment of the invention within
36 the container;

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9

1 Fig 15 is a cross-sectional view through a lower
2 piston for use in the composite piston shown in
3 Fig 14;

4
5 Fig 16 is a cross-sectional view through an upper
6 piston for use in the composite piston shown in
7 Fig 14;

8
9 Fig 17 is a cross-sectional view of the upper and
10 lower pistons of Figs 15 and 16 coupled together
11 in a spaced apart position;

12
13 Fig 18 is a cross-sectional view of the upper and
14 lower pistons of Figs 15 and 16 coupled together
15 in a closed position;

16
17 Figs 19a-19d are side views in cross-section of
18 the apparatus in accordance with another
19 embodiment of the invention during use;

20
21 Fig 20 is a side view of the top part of apparatus
22 in accordance with the present invention, showing
23 an improved tamper seal arrangement; and

24
25 Fig 21 is a view in cross-section of the nozzle
26 end of apparatus in accordance with yet another
27 embodiment of the present invention.

28
29 Figs 22a and 22b are exploded views in cross-
30 section of the nozzle end of apparatus in
31 accordance with a further embodiment of the
32 present invention.

33
34 Referring firstly to Fig 1 of the accompanying
35 drawings, apparatus in accordance with an embodiment of
36 the present invention will be described. The apparatus

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10

1 will be referred to hereinafter as a "pressure pack" or
2 "pack". The pressure pack of Fig 1 is generally
3 denoted 100.

4
5 The pack 100 consists generally of a canister section
6 and a valve section.

7
8 In this example, the canister section comprises a
9 standard preformed cylindrical can 102 which is
10 internally lacquered. It is envisaged that the can 102
11 could be a tin plate beverage can having a bore in the
12 top. Alternatively the can 102 could be manufactured
13 from aluminium.

14
15 The pack 100 is automatically assembled as follows,
16 with reference to Figs 1, 2 and 4 in particular of the
17 accompanying drawings.

18
19 Firstly a sub-assembly is formed from a valve portion
20 104, a boss 106 and an actuator 108, as will now be
21 described in more detail with reference to Figs 1, 2
22 and 4.

23
24 The valve portion 104 is a substantially hollow
25 cylindrical tube, provided with a screw thread 110 on
26 its exterior surface. The valve portion 104 is open at
27 one end (the top as viewed in Fig 2) and has a flap
28 valve 112 attached to its other end by means of a rivet
29 114. The valve portion 104 is also provided with, in
30 this example, four ports 116 around its exterior
31 surface adjacent the screw thread 110 (to the bottom of
32 the screw thread 110 as viewed in Fig 2). It should be
33 noted at this stage that the flap valve 112 is made
34 from a rubber disc which preferably naturally lies in
35 the open position (ie not sealing the end of the
36 valve). This allows air to be expelled out of the

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11

1 pack, through the valve, during pressurisation. The
2 most preferred form of flap valve 312 is shown in
3 Fig 7. The flap valve 112 is shown in the closed
4 position in Figs 1 and 2. It should further be noted
5 that the total area of the ports 116 exceeds the cross-
6 sectional area of the valve portion 104 itself.

7
8 The boss 106 is a substantially hollow cylinder with a
9 large flange portion 118 at one end. The valve portion
10 104 fits snugly within the hollow of the boss 106. The
11 valve portion 104 is fitted into the boss 106 open-end-
12 first and is prevented from moving too far up the boss
13 106 by abutment of the shaped end profile 120 of the
14 valve portion against a corresponding portion 122 of
15 the boss 106. This can be seen in Fig 2, but is also
16 described later with reference to Fig 7. Further, the
17 valve portion 104 may be prevented from falling out of
18 the boss 106 by means of a clip 124 on the exterior of
19 the valve portion 104 which interacts with a slot (not
20 shown) in the interior surface of the boss 106. It
21 should be emphasised, however, that this is an entirely
22 optional feature.

23
24 The actuator 108 is a moulded plastic component having
25 a hollow cylindrical interior and a stepped exterior
26 surface. A screw thread 126 is provided on the
27 interior surface of the actuator 108.

28
29 Following insertion of the valve portion 104 into the
30 boss 106 (and clicking into place) the actuator 108 is
31 placed over the end of the valve portion 104 and
32 screwed onto it by means of cooperation of screw
33 threads 110 and 126. (An optional spring 128 may be
34 dropped into a groove 130 provided in the boss 106
35 prior to fitting the actuator 108. The spring 128 is
36 designed to close the valve if this does not happen

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1 automatically, as will be explained later.)

2

3 Screwing on the actuator 108 completes the sub-
4 assembly.

5

6 Referring now to Fig 3, for ease of understanding, the
7 reference numerals prefixed "1" are the same but
8 prefixed "2". In this embodiment, optional O-rings 232
9 may be provided in annular grooves around the valve
10 portion 204 either side of the ports 216. These O-
11 rings 232 help to form air-tight and product-tight
12 seals, respectively.

13

14 Rings 234 may also be provided on the surface of the
15 flap valve 212 end of the valve portion 204 where it
16 meets the boss 206. The rings 234 form air-tight
17 (plastic-to-plastic) seals between the boss 206 and the
18 valve portion 204, and the flap valve 212 and the valve
19 portion 204 when these components are in contact.

20

21 Referring again to Figs 1 and 2, the sub-assembly is
22 then inserted up the inside of the can 102 until the
23 flange 118 provided on the boss 106 fits into a curled
24 lip 136 at the top of the can 102. This limits further
25 movement of the boss 106. The boss 106 should be a
26 friction fit within the can 102, thereby sealing the
27 end of the can 102. However, if necessary the neck of
28 the can 102 may be crimped below the boss 106 to hold
29 the sub-assembly in place.

30

31 Following insertion of the sub-assembly, a double
32 piston assembly 138 is inserted into the can 102. The
33 piston assembly 138 comprises two interlocking plastic
34 cup sections 140a,b, each having a stem portion 142a,b
35 in its centre. The cup sections 140a,b lock together
36 and a cavity or chamber 144 is formed between them.

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13

1 The outer surface of the double piston assembly 138 is
2 in sliding contact with the internal surface of the can
3 102. The chamber 144 is filled with a measured
4 quantity of sealant to form a pressure seal. The
5 sealant not only fills the chamber 144, but also fills
6 the annular space 146 in contact with the internal
7 surface of the can 102.

8
9 The piston assembly 138 is formed by squirting sealant
10 (in this case glycerine and starch mix at +45°C) into
11 the first cup 140a or "first piston", then allowing the
12 sealant to cool and placing the second cup 140b or
13 "second piston" onto the first 140a. This is done
14 prior to insertion of the piston assembly 138 into the
15 can 102. As the second piston 140b is fitted into the
16 first 140a, the sealant is displaced within the cavity
17 144 formed between them. There is a minor "click" at
18 this stage as the pistons 140a,b engage each other.
19 Then the piston assembly 138 is rammed up the can 102
20 to the boss 106 and as this occurs the two pistons
21 140a,b are forced together. There is another "click"
22 as the pistons 140a,b then lock together by means of a
23 clip mechanism 148 on the stems 142a,b. At this second
24 click the sealant is displaced into the annular ring
25 146 to form a propellant-tight seal. Other methods of
26 interlocking the pistons and/or introducing the sealant
27 are envisaged.

28
29 This piston arrangement gives advantages over known
30 piston arrangements. For example, the hollow stem 142b
31 of the second piston 140b permits air to exit the space
32 between the first and second pistons 140a and 140b, up
33 to the time when they lock together. In a modification
34 (not shown) the first piston could be provided with a
35 central valve, to permit passage of air from above the
36 piston assembly.

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1 The volume 150 of the can 102 behind the piston
2 assembly 138 is now pressurised in the conventional
3 way, for example to 70 psi for a 47mm diameter can, and
4 an aerosol dome 152 fitted thereby sealing the pack
5 100. It is envisaged that, at this stage, the pack 100
6 will be supplied to the customer (ie a product
7 manufacturer) for filling, labelling and fitting of the
8 nozzle and the lever mechanism described below. The
9 product may be fixant, sealant, glue or the like.
10 Alternatively, it could be a foodstuff such as cake
11 icing, or a pharmaceutical, or a cosmetic product such
12 as depilatory cream.

13
14 At this stage, it should be noted that a small air
15 space 154 is left between the piston assembly 138 and
16 the valve 104. This can be seen, for example, in Fig
17 2. The airspace 154 is of a minimum size of 2ml and is
18 provided by shaping the crown of the piston 140a to fit
19 the valve profile and the boss 106 leaving the required
20 gap. Once the pack is pressurised, the increased
21 pressure against the flap valve keeps it in the closed
22 position.

23
24 Fig 6 is a view of the pack 100 during filling.
25 Filling may be done by a manufacturer of the product at
26 their own premises. A bulk pack of product (not shown)
27 is filled into the can 102 by means of a product fill
28 tube 156 in the direction of arrows B in Fig 6.

29
30 The tube 156 is inserted down through the interior of
31 the valve portion 104 until the end of the tube 156 is
32 adjacent the flap valve 112. (In a preferred
33 embodiment, as seen in Fig 7, a seal is formed around
34 the tube 356 by means of an O-ring 358.)

35
36 As product is introduced (for example, in excess of

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15

1 183 psi to fill a can at 70 psi) a small amount fills
2 the gap 154 between the piston 138 and the valve/boss
3 assembly. This product then begins to force the piston
4 assembly 138 down into the can 102 against the pressure
5 of the propellant in volume 150. The piston crown is
6 specially profiled to enable product to flow down over
7 the piston to enable this initial movement to occur. A
8 preferred design of piston 338 is also shown in Fig 7.

9
10 As the product continues to flow down the fill tube 156
11 the piston assembly 138 is forced down the can 102
12 toward the dome 152. Flap valve 112 is then able to
13 return to its natural position, ie the open position,
14 and further product flows into the volume 160 between
15 the piston crown and the boss/valve. This filling
16 continues until the required product fill is achieved
17 or the piston 138 reaches the dome 152 (ie as seen in
18 the view of Fig 8a) whichever is sooner.

19
20 The customer can then affix a label or other
21 identifying feature to the filled can 102 and then a
22 lever cap 162 is placed over the protruding parts of
23 the boss 106, the valve 104 and the actuator 108. The
24 lever cap 162 is shown in Fig 5 and is provided with
25 snappers 164 around its bottom edge. These snappers
26 164 are resiliently formed and once "snapped" into
27 place co-operate with the lip 136 of the can 102 to
28 hold the lever cap 162 securely in place.

29
30 The lever cap 162 is moulded as a single piece of
31 plastic and has a handle 166 and a base 168. The
32 handle 166 is joined to the base 168 by means of a
33 butterfly hinge 170. The handle 166 and base 168 are
34 each provided with overlapping apertures 172 through
35 which parts of the valve portion 104 and the actuator
36 108 protrude when the lever cap 162 is in place. The

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16

1 handle 166 is folded over on the hinge 170 so that
2 these apertures 172 overlap. Fig 4 shows various parts
3 of the pack 100 exploded. In Fig 4 the lever cap 162
4 is shown in the open (ie moulded) position.

5
6 The lever cap 162 is shown in place in Fig 8a, for
7 example. The pack 100 is completed with a nozzle 174
8 and a protective end cap (see 276 in Fig 3, for
9 example) which is fitted after the lever cap 162. The
10 nozzle 174 is screwed onto an external screw thread 178
11 provided on the actuator 108. Different lengths of
12 nozzle may be used if required.

13
14 The lever cap 162 may also be provided with a seal
15 mechanism 180 (as can be seen in Figs 8a-8c). The seal
16 180 prevents unwanted movement of the lever handle 166
17 prior to first use and serves as an indication of any
18 tampering.

19
20 Referring now to Figs 8a-8c, the pack 100 is shown in
21 Fig 8a in the form in which it is retailed. Volume 160
22 is filled with product and the handle 166 of the lever
23 162 is in the fully closed position. Seal 180 is still
24 intact. The lever handle 166 rests on a flange 182
25 provided around the bottom of the actuator 108. An
26 actuating knuckle 184 on the handle 166 contacts the
27 flange 182. The knuckle 184 can be seen in Fig 5.

28
29 To dispense product, the seal 180 is broken, the end
30 cap is removed and the nozzle 174 is cut open. The
31 actuator 108 is then twisted relative to the valve
32 portion 104 on screw thread 110. The screw thread is
33 preferably an acme triple thread. Typically one 360°
34 turn will fully open the pack 100.

35
36 The broken seal 180 can be seen in Fig 8b. An

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17

1 alternative seal arrangement could be provided on the
2 pack, as sold, consisting of an anti-tamper tab. This
3 tab could be a piece of plastic adapted to attach to
4 the lever handle and fit within one of the grooves 190
5 described below. When attached, abutment of the seal
6 against the side of the groove prevents turning of the
7 actuator relative to the lever handle and also prevents
8 lifting of the lever handle. The seal is broken by a
9 user pulling off the piece of plastic prior to use of
10 the pack. This seal may be provided on the dog tooth
11 188 described below, for example.

12

13 As the actuator 108 turns, the lever handle 166 lifts
14 on the hinge 170 due to the action of the actuator
15 flange 182 against the actuating knuckle 184. This can
16 be seen in the view of Fig 8b. The greater the flow
17 rate of product required, the more the lever handle
18 should be raised prior to use. The spring 128 is
19 extended at this point.

20

21 To dispense product, a user then presses down on the
22 lever handle 166 (moving it toward the body of the can
23 102). This pushes the actuator 108 and the valve 104
24 (which is attached to the actuator 108 via their
25 cooperating screw threads 110,126) down relative to the
26 boss 106. This is the position seen in Fig 8c.
27 Product is then urged to flow, by virtue of the
28 internal pressurisation of the pack 100 against the
29 piston 138 which then moves up toward the valve 104
30 forcing product from volume 160 through the ports 116
31 and up through the valve portion 104 and out through
32 the nozzle 174 (in the direction of arrows A in Fig
33 8c). Because the area of the ports is greater than the
34 bore diameter, the flow rate is the same as with
35 conventional packs. Backfill is also possible for this
36 reason.

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1 To stop dispensing, the user simply releases the lever
2 handle 166. This closes the valve by allowing it to
3 slide back up the bore and closing access through the
4 ports 116. If a spring 128 is included in the pack, it
5 will urge the valve closed, but in many cases the
6 internal pack pressure will close the valve reliably,
7 without the need for a spring.

8

9 The greater the angle between the lever handle 166 and
10 the can 102 prior to dispensing, the greater the
11 possible torque on the actuator/valve and hence the
12 greater the flow rate obtained from the pack 100.
13 Markings may be provided (by moulding for example) on
14 the side face 186 of the lever handle 166 which
15 indicate the flow rate that will be achieved when
16 depressing the handle 166 from that lever angle.

17

18 The lever 162 is also provided with a dog tooth 188 on
19 the interior of the aperture 172 in the lever handle
20 166. This dog tooth 188 is designed to fit into slots
21 or axial grooves 190 (see Fig 4) provided adjacent the
22 top of the actuator 108. If the actuator 108 is
23 unscrewed and the lever handle 166 rises sufficiently,
24 the dog tooth 188 engages in one of these grooves 190
25 and butts against the side of the groove 190 to prevent
26 further turning. In this way, the actuator/valve
27 cannot be fully removed from the pack.

28

29 In addition, the flange 182 of the actuator 108 is
30 provided with a projection 192 on its lower surface.
31 This projection 192 can be seen in Fig 2 and is
32 designed to click into one of a set of corresponding
33 indents (not shown) provided at equal intervals around
34 a ring on the top surface of the boss 106 when the
35 actuator 108 reaches the fully closed position. This
36 indicates to a user that the actuator 108 is "locked-

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19

1 off".

2

3 Embodiments of the invention are envisaged whereby
4 product can be dispensed in a predetermined dose.
5 Doses may be adjusted by adjusting the nozzle length.

6

7 Part of one such embodiment can be seen in Fig 9 of the
8 accompanying drawings. The apparatus of Fig 9 is
9 substantially identical to that already described, but
10 is provided with a return spring 194 and a piston/valve
11 assembly 196 within the interior of the nozzle 174,
12 valve 104 and actuator 108. Fig 9 shows the actuator
13 108 in the fully closed position.

14

15 The piston/valve assembly 196 is in the form of a
16 cylindrical hollow cage which is a sliding fit within
17 the interior of the nozzle, etc. The assembly 196 is
18 provided with a one-way valve 198 at the end nearest
19 the spring 194. In this embodiment, the first time the
20 lever handle 166 is raised and depressed, product is
21 forced up behind the cage, and the pressure then forces
22 the piston/valve assembly 196 toward the nozzle end
23 (the valve 198 remaining closed). This in turn
24 compresses the return spring 194. When the handle 166
25 is released, the spring 194 forces the assembly 196
26 back down, the valve 198 being open in this phase,
27 thereby leaving a dose of product (which passes through
28 the cage and the open valve) within the interior of the
29 nozzle, etc. To dispense the dose, the handle 166 is
30 raised and depressed again. This action simultaneously
31 "refills" the interior with a further dose of product
32 for the next application. This procedure can be
33 continued until the apparatus is empty. An end cap
34 (not shown) protects the dose from exposure to the
35 atmosphere when the apparatus is not in use. It is
36 envisaged that apparatus having the features shown in

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20

1 Fig 9 would be particularly suitable for dispensing of
2 pharmaceuticals and the like.

3

4 The components of a preferred piston assembly will now
5 be described with reference to Figs 10, 11 and 12.

6

7 The piston assembly consists of a primary piston 200
8 and a secondary piston 202. Both pistons 200, 202 are
9 generally cup shaped, with stem portions 204, 206 in
10 their centres. The pistons 200, 202 are designed to
11 interlock with one another, by means of teeth 208 on
12 the stem of the primary piston 200 and a flange 210 on
13 the stem of the secondary piston 202, thereby defining
14 a sealant chamber. In use, the sealant chamber is
15 filled with sealant. In the piston assembly formed
16 from pistons 200 and 202, approximately 7g of sealant
17 is required to fill the chamber. This compares
18 favourably with over 30g required to fill sealant
19 chambers in known piston assemblies. This reduces
20 costs involved in manufacture of packs incorporating
21 the piston assembly of the present invention.

22

23 The example shown in Figs 10 to 12 has a further
24 advantageous feature in that the top wall 212 of the
25 secondary piston 202 is made from a flexible plastics
26 material having a number of thin pocket sections 214
27 therein. These pockets 214 are designed to balloon on
28 expansion of sealant within the sealant chamber (as
29 occurs during storage of a filled pack), thereby
30 accommodating the sealant and preventing the primary
31 and secondary pistons from separating or becoming
32 unlocked from one another. This is a significant
33 advantage of the piston assembly of the present
34 invention.

35

36 Referring now to Fig 13, there is shown a piston

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1 assembly 216 similar to that described above with
2 reference to Figs 10 to 12, within a standard two piece
3 aerosol can. This arrangement differs from that
4 described earlier in that the can must be "backward
5 filled" with the components as the bottom end 218 is
6 initially sealed apart from a small fill valve 220.

7
8 The valve assembly 222 of the pack of Fig 13 and in
9 particular, the boss portion 224 is specially designed
10 to fit snugly within the top piece 226 of the two piece
11 can. The view of Fig 13 shows the top piece 226 (with
12 valve assembly 222 therein) just prior to fitting onto
13 the can section 228.

14
15 It should be noted that the boss portion 224 is only
16 one of many possible fittings for the top piece 226.
17 The top piece 226 is a standard open top cone and may,
18 in other embodiments, have other valve assemblies
19 fitted therein. For example, a standard aerosol valve
20 such as a spray valve or tilt valve (for dispensing
21 cream, etc) may be fitted. It should also be noted
22 that the upper profile of the piston assembly may
23 require modification to accommodate components of such
24 valves which protrude into the body of the can. This
25 may be achieved using the hollow stem of the secondary
26 (uppermost) piston to make room for the valve
27 components when the piston assembly is in its uppermost
28 position.

29
30 In the embodiment of Fig 13, the secondary piston 202
31 is introduced into the can first. The hollow stem 206
32 of the secondary piston 202 allows air to escape from
33 the space between the piston 202 and the bottom 218 of
34 the can when the piston 202 is being inserted. It will
35 be noted that a cylindrical tube 230 is provided on the
36 underside of the secondary piston 202, which contacts

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22

1 the base of the can before the rest of the piston 202,
2 thereby leaving a space between the outer skirt 232 of
3 the piston 202 and the base 218 of the can.

4
5 Following the insertion of the secondary piston, the
6 primary piston 200 (with sealant therein) is inserted
7 into the can. As the primary piston 200 is forced down
8 the can, air can escape from underneath the primary
9 piston 200, through the hollow stem 206 of the other
10 piston 200 and out through the valve 220 in the base of
11 the can. This air escape can take place up to the
12 point where the pistons 200, 202 engage one another.
13 Any remaining air trapped between the pistons can then
14 travel down the sides of the secondary piston 202, (the
15 pressure of the air temporarily collapsing the outer
16 skirt 232), and through apertures (not shown) in the
17 bottom of the tube 230 of the secondary piston 202, to
18 eventually escape through the valve 220. The can is
19 then ready to have the top piece 226 fitted. It should
20 be noted that any top piece/valve assembly may be
21 fitted depending on an end user's requirements.

22
23 The components of a piston assembly according to a
24 further embodiment of the invention will now be
25 described with reference to Figs 14 to 18. Fig 14
26 shows a cross-sectional view through a container 401
27 which contains a product 402 which is to be dispensed
28 through an outlet 403 in the container 401 to a valve
29 404 which controls dispensing of the product through a
30 nozzle 405. The valve 404 which is attached to the
31 outlet 403 by a screw thread and the nozzle 405 is
32 attached to the valve 404 also by a screw thread.

33
34 Located within the container 401 are two pistons 408,
35 409 between which a viscous material 410 is located.
36 The pistons 408, 409 and the viscous material 410

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23

1 separate the product 402 from a propellant 406 in the
2 container 401. The propellant may be any suitable
3 propellant. Typically, the propellant is a substance
4 which is gaseous at normal temperature and pressure but
5 liquifies when pressurised.

6
7 The pistons 408, 409 are coupled to each other by a
8 central tube section 412 on the piston 409 which
9 engages with a central aperture 411 in the piston 408.
10 The pistons 408, 409 are shown in more detail in Figs
11 15 and 16.

12
13 Fig 15 is a cross-sectional view of the piston 408.
14 The piston 408 has a skirt section 413 which contacts
15 the inside surface of the wall of the container 401.
16 The piston 408 also has an annular section 414 which is
17 connected to the skirt section 413 by a side wall 415.
18 A central tubular section 416 depends from the inside
19 of the annular section 414 to define the central
20 aperture 411. Located at the end of the tubular
21 section 416, remote from the annular section 414, is a
22 nibbed flange 417 which is directed towards the centre
23 of the aperture 411. The portion of the tubular
24 section 416 on which the flange 417 is located has a
25 wall thickness less than the portion of the tubular
26 section 16 adjacent the annular section 414 to enable
27 the flange 417 to flex outwards.

28
29 Fig 16 is a cross-sectional view of the piston 409.
30 The piston 409 has a central section 418 from which
31 depends a skirt section 419 which engages with the
32 inside wall of the container 401. Depending centrally
33 from the central section 418 is the tube section 412
34 which has a number of ridges 421 adjacent the central
35 section 418 and a ratchet portion 422 at the end of the
36 tube section 412 remote from the central section 418.

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1 Next to the ratchet formations 422 is a groove 423
2 which extends circumferentially around the tube section
3 412.

4
5 In use, the section of piston 409 between the tube
6 section 412 and the skirt 419 is filled with the
7 viscous material 410. The tube section 412 is then
8 inserted into the central aperture 411 in the piston
9 408 defined by the tubular section 416 until the
10 ratchet formations 422 contact the flange 417. Further
11 pushing together of the pistons 408, 409 causes
12 deflection of the flange 417 to engage in the ratchet
13 formations 422. The ratchet formations are shaped such
14 that pistons 408, 409 may be pushed together but they
15 may not be easily separated after the flange 417 has
16 engaged in the ratchet formations 422.

17
18 Ridges 421 frictionally engage with the internal side
19 walls of the tubular section 416 and help prevent the
20 viscous material passing between the tubular section
21 416 of the piston 408 and the tube section 412 of the
22 piston 409.

23
24 The composite piston formed by the pistons 408, 409 and
25 the viscous material 410 may then be inserted into the
26 container 401 and used as shown in Fig 14.

27
28 The invention has the advantage that the interengaged
29 flange 417 and ratchet formations 422 mitigate the
30 possibility of the pistons 408, 409 separating due to
31 propellant 406 entering the viscous material 410
32 between the pistons 408, 409 and pushing the pistons
33 408, 409 apart which may compromise the effectiveness
34 of the composite piston in mitigating the possibility
35 of the propellant 406 leaking into the product 402.

36

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25

1 However, the pistons 408, 409 are permitted to move
2 towards each other to ensure that there is a constant
3 force of viscous material pressed against the inside
4 wall of the container, as the flange 417 can move
5 further up the ratchet formations 422 until the annular
6 section 414 butts against the central section 418, as
7 shown in Fig 18.

8
9 The presence of the viscous material 410 on the inside
10 wall of the container reduces the frictional forces
11 between the wall engaging skirts 413, 417 and helps to
12 give a smooth movement of the pistons 408, 409 within
13 the container 401. In addition or alternatively, the
14 viscous material 410 may also be used as a sealing
15 material to help prevent components of the product
16 permeating either through the pistons 408, 409 or
17 between the wall engaging skirts 413, 417 and the
18 inside wall of the container 401.

19
20 In the example shown in Fig 14, the pistons are pushed
21 towards the outlet 403 by the propellant 406 when the
22 valve 404 is opened by a user. This causes the product
23 402 to exit the outlet 403, pass through the valve 404
24 and pass out through the nozzle 405.

25
26 However, in an alternative example the propellant 406
27 and the base 407 of the container 401 may be omitted.
28 In this example, the container 401 may be inserted into
29 a mechanical device (not shown) which pushes the
30 pistons 408, 409 towards the outlet 403 in order to
31 dispense product 402 from the outlet 403 and desired by
32 a user.

33
34 Referring now to Figs 19a to 19d, a modified composite
35 piston is shown in which a detent portion 510 is
36 provided not at the end of the stem or tube section 506

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26

1 of the secondary piston 502, but at an intermediate
2 point on the stem 506. During assembly of the
3 composite piston, the secondary piston 502 is pushed
4 into the container 528 until the end 512 of the stem
5 502 abuts the domed base 518 of the container, as shown
6 in Fig 19a. Castellations 522 may be provided in the
7 stem wall arranged around the circumference of the end
8 512 of the stem, to enable air to pass from the volume
9 530 outside the stem to the volume 532 inside the stem
10 and vice versa.

11
12 As shown in Fig 19b the primary piston 500 is then
13 pushed into the container until the first indented
14 portion of the ratchet formation 508 engages with the
15 detent 510 in the first click position. As the primary
16 piston 500 is pushed further so that the third indented
17 portion of the ratchet formation 508 engages with the
18 detent 510 in the third click position, the sealant 512
19 fills the space between the primary and secondary
20 pistons, and escaping air is pushed between the wall
21 engaging skirt 516 and the container to voided volume
22 530, from where it can escape through the valve 520.
23 Fig 19c shows the primary and second pistons in the
24 third click position.

25
26 The sealant 512 is placed in the primary piston in a
27 predetermined dose. There is a tolerance on the volume
28 of this dose. The ratchet formation 508 enables the
29 composite piston to function equally well if the volume
30 of sealant is slightly more or less than the standard
31 volume. If there is more sealant, then sealant will
32 fill the space when the second indented portion of the
33 ratchet formation 508 engages with the detent 510 in
34 the second click position. If there is less sealant,
35 then sealant will fill the space when the fifth
36 indented portion of the ratchet formation 508 engages

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27

1 with the detent 510 in the fifth click position, as
2 shown in Fig 19d, when the end of the primary stem 504
3 is flush with the end of the secondary stem 506.

4
5 The stem 506 extends a sufficient distance so that it
6 engages with the domed base 518 of the container before
7 the wall engaging skirt 516 engages the curved portion
8 534 of the container, where the container wall 528
9 ceases to be straight. In this way air can still
10 escape between the skirt 516 and the container wall
11 528.

12
13 Referring now to Fig 20, an improved nozzle/end cap
14 arrangement 234 can be seen. This arrangement combines
15 the end cap 236 with the anti-tamper tab 238 of the
16 assembly. The end cap 236 in this example is formed
17 integrally with the lever cap 240 during moulding. The
18 anti-tamper tab 238 comprises a Y-shaped piece of
19 plastic which engages one of the eight flutes 242
20 provided on the valve actuator as can be seen in Fig
21 20. The tab 238 is broken off prior to first turning
22 of the actuator, to allow for normal use of the pack.

23
24 The view seen in Fig 20, with the end cap 236 still
25 attached to the lever cap 240, is as the pack would be
26 presented for sale. This advantageously reduces the
27 overall height of the pack, by removing the end cap
28 from the nozzle 244, so that it may fit more readily
29 onto product display shelving. Optionally, nozzle
30 length may also be reduced, if required.

31
32 After purchase, when the nozzle 244 has been cut open,
33 the nozzle can be protected by breaking off the end cap
34 236 from the lever cap 240 (at snap off bridges 246
35 provided therebetween) and placing the end cap 236 in
36 the position shown in broken lines in Fig 20. This

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28

1 breaking off of the end cap 236 also removes the Y-
2 shaped tab 238 from engagement with the actuator flutes
3 242.

4
5 The nozzle 244 also is provided with teeth 246 at its
6 lowermost end. These teeth 246 cooperate with the
7 flutes 242 on the actuator to prevent unwanted removal
8 of the nozzle. Radial bridges 248 provided which are
9 adapted to break off when the nozzle 244 is unscrewed
10 with sufficient force. This web/ratchet arrangement
11 acts as a convenient deterrent to unwanted removal of
12 the nozzle prior to purchase, and as an indicator of
13 any tampering.

14
15 In general, the apparatus already described includes a
16 boss portion which is inserted up the middle of the
17 empty canister with the valve assembly therein.
18 However, it is possible to mount the valve assembly on
19 the top end of a canister by means of a specially
20 adapted mounting cap. An example of the mounting cap
21 300 can be seen in Fig 21.

22
23 The valve 601 is mounted in the cap 600 and an actuator
24 602 fitted to the valve 601 in a similar manner to that
25 previously described. An optional support component
26 603 may be provided as can be seen on the right hand
27 side of Fig 21. Alternatively, the support component
28 is not provided, and the cap 600 continues upwards to
29 form a sleeve 604 surrounding the entry valve 601 to
30 the underside of the actuator 602, as can be seen on
31 the left hand side of Fig 21. A spring 605 is also
32 provided (the benefits of which have already been
33 discussed with reference to other drawings) which at
34 one end sits within a recess 606 provided in the
35 actuator.

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29

1 The entire valve/actuator/mounting cap assembly is then
2 lowered onto the top of a canister 607 (in this case a
3 two piece aerosol can) and crimped over the top, by
4 crimping a curled lip 608 provided on the cap 600
5 around the outside of the top rim 609 of the can. The
6 top rim 609 is typically a circular rim 1 inch (25.4
7 mm) in diameter, of the sort generally known in the
8 art.

9
10 The can 600 could alternatively be a three-piece
11 aerosol can (with sealing dome) or any known aerosol
12 with a hole provided in the top. Alternatively the can
13 600 may be a one piece can formed with tapering sides
14 which narrow towards the circular rim, which is
15 typically 1 inch or 25.4 mm in diameter.

16
17 The valve assembly in this example is modified from
18 those of earlier described embodiments. A nozzle 610
19 with end cap 611 is fitted to the valve 601 by means of
20 a screw thread 620 of increased length, for greater
21 strength. The nozzle 610 is not directly connected to
22 the actuator 602. This assembly has advantages over
23 those already described, for example as the nozzle is
24 tightened onto the valve, this does not cause the valve
25 to open and so no product weeps out of the end of the
26 nozzle.

27
28 Other components shown in Fig 21 are similar to those
29 already described. It should be noted that the plastic
30 lever 630 already described could be replaced by a more
31 simple lever arrangement, for example a conventional
32 wire lever could be used. The container is filled in
33 the following manner. First the composite piston is
34 inserted into the can while the top of the can is open
35 and lip 621 is flared outwardly to aid insertion of the
36 piston. Then the can is closed to form a one inch (25.4

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30

1 mm) hole, either by fitting top piece 622 or by forming
2 the can to a taper. The can is then filled with the
3 product from the top. Then the valve assembly
4 comprising the valve 601, actuator 602, nozzle 610, cap
5 600 and lever is fixed to the top rim 609 by crimping
6 the curled lip 608.

7
8 The anti-tamper tab 640 comprises a planar piece of
9 plastic connected to the lever 630 which engages one of
10 the eight flutes 642 provided on the valve actuator.
11 The tab 640 is broken off prior to screwing on the
12 nozzle 610 and the first turning of the actuator, to
13 allow for normal use of the pack.

14
15 Another advantage of the embodiment of Fig 21 is that
16 no boss is required to fit the valve assembly. This
17 means that the ultimate capacity of the can can be
18 greater than with the other described embodiments, and
19 the overall appearance of the pack is not substantially
20 affected.

21
22 Figs 22a and 22b show exploded views of an embodiment
23 similar to that of Fig 21. Before fixing the valve
24 assembly to the canister, the valve assembly is
25 assembled by inserting the valve 701 into the cap 700
26 from below, and then screwing a retaining member 715
27 provided with an internal thread onto the external
28 thread on the protruding portion of the valve 701 in
29 order to hold the valve in place. The external surface
30 of the retaining member 715 is provided with
31 longitudinal ribs 716. The actuator 702 is provided
32 with corresponding internal ribs 717. When the
33 actuator 702 is placed over the retaining member 715
34 the ribs 716, 717 engage with each other so that the
35 actuator 702 and the retaining member 715 are
36 rotationally coupled. A detent portion 718 on the

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31

1 external surface of the retaining member 715 engages
2 with a corresponding recessed groove 719 on the inner
3 surface of the actuator 702, to hold the actuator 702
4 on the retaining member 715. The nozzle 710 and end
5 cap 711 are screwed to the valve 701, in a similar way
6 to the embodiment of Fig 21. The cap may be provided
7 with a hinge portion 720 for use with a conventional
8 wire lever to control the valve operation.
9 Alternatively the cap may be used with a moulded
10 plastic lever of the type shown in Figs 8a and 8b.

11
12 It is to be understood that the containers according to
13 the invention may be filled from the bottom, if
14 required, by providing a separate domed base which is
15 sealed to the container after insertion of the product
16 and the composite piston.

17
18 The packs described have significant advantages over
19 and above known packs including that they may be filled
20 and refilled by manufacturers or retailers on their own
21 premises from bulk quantities of product, instead of
22 sending product to be filled into the packs during
23 manufacture. This means that product-filled packs are
24 much cheaper and easier to produce. The packs
25 themselves are also much cheaper and easier to produce.

26
27 Modifications and improvements may be made to the
28 foregoing without departing from the scope of the
29 invention.

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1 CLAIMS

2

3 1. Dispensing apparatus for dispensing a product from
4 a container under pressure of a propellant, said
5 apparatus comprising a product chamber within the
6 container and a valve adjacent to the product chamber,
7 characterised in that the valve allows product flow
8 into and out of the product chamber.

9

10 2. Dispensing apparatus according to Claim 1, wherein
11 the product chamber contains a piston, situated between
12 the propellant and the valve.

13

14 3. Dispensing apparatus according to Claim 1 or 2,
15 wherein the valve is operated by means of an actuator
16 and a lever.

17

18 4. Dispensing apparatus according to Claim 3, wherein
19 the actuator and the lever co-operate by means of a
20 screw thread arrangement, such that turning of the
21 actuator relative to the lever varies the flow rate of
22 product out of the apparatus.

23

24 5. Dispensing apparatus according to Claim 4, wherein
25 the actuator is adapted to be turned between a "lock-
26 off" position in which operation of the lever does not
27 cause the valve to be opened, and a fully on position,
28 in which operation of the lever causes the valve to be
29 opened to produce a maximum flow rate of product.

30

31 6. Dispensing apparatus according to Claim 5, wherein
32 indicating means is provided to demonstrate to a user
33 that the actuator is in the "lock off" position.

34

35 7. Dispensing apparatus according to Claim 5, wherein
36 said indicating means is a groove or substantially

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33

1 axial slot in the external wall of the actuator.

2

3 8. Dispensing apparatus according to any preceding
4 Claim, wherein the container is made substantially from
5 tin plate or aluminium.

6

7 9. Dispensing apparatus for dispensing a product from
8 a container under pressure of a propellant, said
9 apparatus comprising a product chamber within the
10 container, a piston slidably located within said
11 product chamber and a valve adjacent to the product
12 chamber, wherein the valve is operated by means of an
13 actuator and a lever.

14

15 10. Dispensing apparatus according to any one of
16 Claims 1 to 9, wherein said valve comprises a
17 substantially hollow cylindrical tube open at the first
18 end and having one or more ports arranged around the
19 circumference of the tube adjacent to the second end.

20

21 11. Dispensing apparatus according to Claim 10,
22 wherein the area of said ports is greater than the
23 cross-sectional area of said cylindrical tube.

24

25 12. Dispensing apparatus according to Claim 10 or 11,
26 further comprising a boss or cap member, said valve
27 being located within said boss or cap member such that
28 said valve can slide longitudinally within said boss or
29 cap member, said valve being provided with a shaped end
30 profile at said second end adapted to abut a
31 corresponding portion of the boss or cap member to
32 close said valve.

33

34 13. Dispensing apparatus according to Claim 12,
35 wherein said container is provided with a circular
36 aperture, wherein said boss or cap member is adapted to

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34

1 fit to said circular aperture, said valve and actuator
2 being attached to said cap member.

3

4 14. Dispensing apparatus according to Claim 13,
5 wherein said cap member comprises a curled lip portion
6 adapted to be secured to the rim of said circular
7 aperture.

8

9 15. Dispensing apparatus according to any one of
10 Claims 10 to 14, wherein the second end of said
11 cylinder is closed.

12

13 16. Dispensing apparatus according to any one of
14 Claims 10 to 14, wherein the second end of said
15 cylinder is provided with a flap valve adapted to allow
16 insertion of a product into said container when said
17 product chamber is not pressurised and adapted to close
18 when said product chamber is pressurised.

19

20 17. Composite piston for use in dispensing apparatus,
21 said composite piston comprising a first piston, a
22 second piston and a coupling means, the coupling means
23 movably coupling the first and second pistons to each
24 other and permitting limited relative movement between
25 the first and second pistons in a direction
26 substantially parallel to the direction of movement of
27 the composite piston.

28

29 18. Composite piston according to Claim 17, wherein
30 the first and second pistons interlock in use defining
31 a piston sealant chamber.

32

33 19. Composite piston according to Claim 18, wherein
34 the piston sealant chamber is open circumferentially.

35

36 20. Composite piston according to any one of Claims 17

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35

1 to 19, wherein the coupling means comprises a
2 projection on one of the first and second pistons and a
3 recess in the other of the first and second pistons,
4 and the projection engages in the recess to couple the
5 pistons to each other.

6
7 21. Composite piston according to Claim 20, wherein
8 the projection and the recess include mutually
9 engageable ratchet formations which permit movement of
10 the pistons relative to each other in one direction
11 only.

12
13 22. Composite piston according to Claim 20 or 21,
14 wherein the recess is a central aperture in one of the
15 pistons and the projection is a central projection on
16 the other piston arranged to engage the recess.

17
18 23. Composite piston according to any one of Claims 17
19 to 22, wherein the pistons are manufactured from a
20 flexible, resilient material, such as plastic.

21
22 24. Composite piston according to any one of Claims 17
23 to 23, wherein the composite piston also includes a
24 viscous substance which in use contacts the inside wall
25 of a container adjacent the composite piston and is
26 adapted to facilitate sealing of the composite piston
27 against the inside walls of the container and/or reduce
28 friction between the composite piston and the inside
29 walls of the container.

30
31 25. Composite piston according to Claim 24, wherein
32 the piston assembly is provided with expansion means
33 for accommodating expansion of the sealant, in use.

34
35 26. Composite piston according to Claim 25, wherein
36 said expansion means comprises thinned portions

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36

1 provided on the first and/or second piston, said
2 thinned portions forming pockets which are adapted to
3 expand in a balloon-like manner to accommodate sealant
4 expansion in use.

5

6 27. Dispensing apparatus according to any one of
7 Claims 2 to 16, wherein the piston is a composite
8 piston according to any of Claims 17 to 26.

9

10 28. Container for dispensing a product therefrom, the
11 container comprising a composite piston according to
12 any of Claims 17 to 26 movably mounted within the
13 container and an outlet through which the product is
14 dispensed, the container walls and the composite piston
15 defining a product chamber within the container, and
16 movement of the composite piston within the container
17 towards the outlet expelling product through the
18 outlet.

19

20 29. Container according to Claim 28, wherein the
21 composite piston comprises viscous material located
22 between the first and second pistons and adapted to be
23 forced into engagement with the inside wall of the
24 container by a compression force which acts between the
25 first and second pistons to cause the second piston to
26 move towards the first piston.

27

28 30. Container according to Claim 29, wherein the
29 composite piston further comprises a wall engaging
30 skirt which abuts against an inside wall of the
31 container.

32

33 31. Container according to Claim 30, wherein a wall-
34 engaging skirt is provided on both the first and the
35 second pistons.

36

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37

1 32. Container according to any one of Claims 28 to 31,
2 wherein the container is a pressure pack dispenser
3 which comprises a propellant system which pushes the
4 piston towards the outlet.

5

6 33. Container according to any one of Claims 28 to 31,
7 wherein the container is adapted for use in combination
8 with a mechanical actuating device which pushes the
9 composite piston towards the outlet of the container.

10

11 34. Container for use in dispensing apparatus, said
12 container comprising a hollow cylindrical portion and a
13 boss portion, said cylindrical portion being open at
14 one end for attachment of a sealing dome and having a
15 curled in portion at the other end for engagement with
16 a corresponding flange provided on the boss portion.

17

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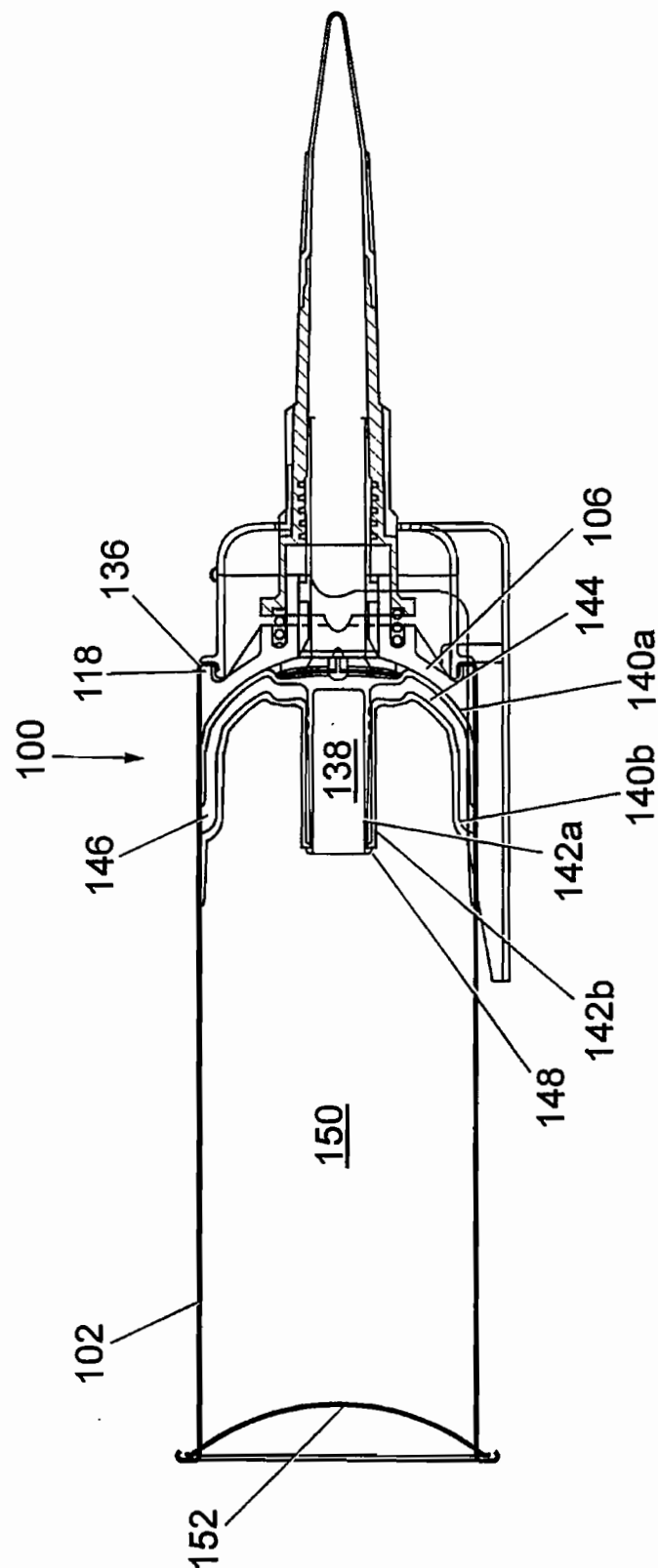


Fig. 1

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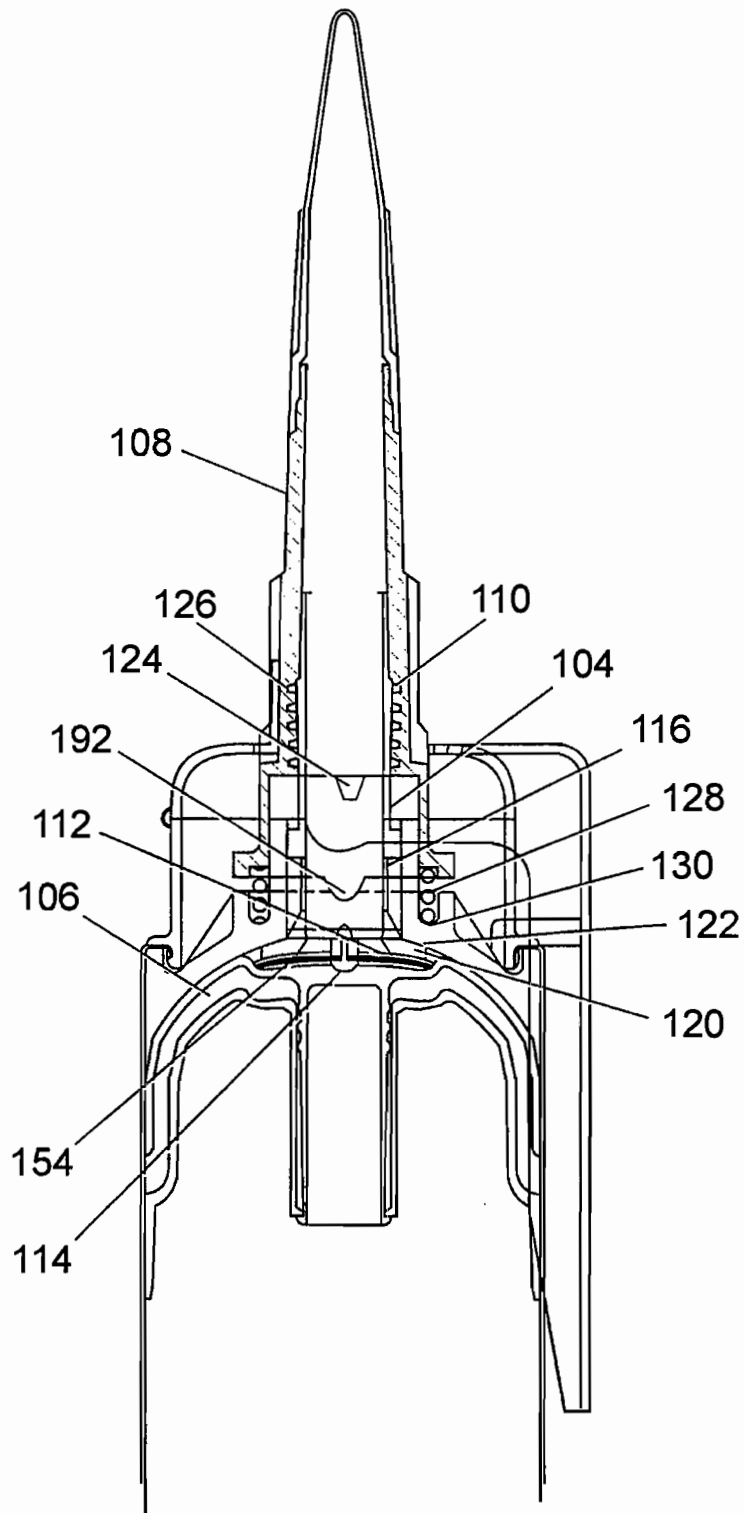


Fig. 2

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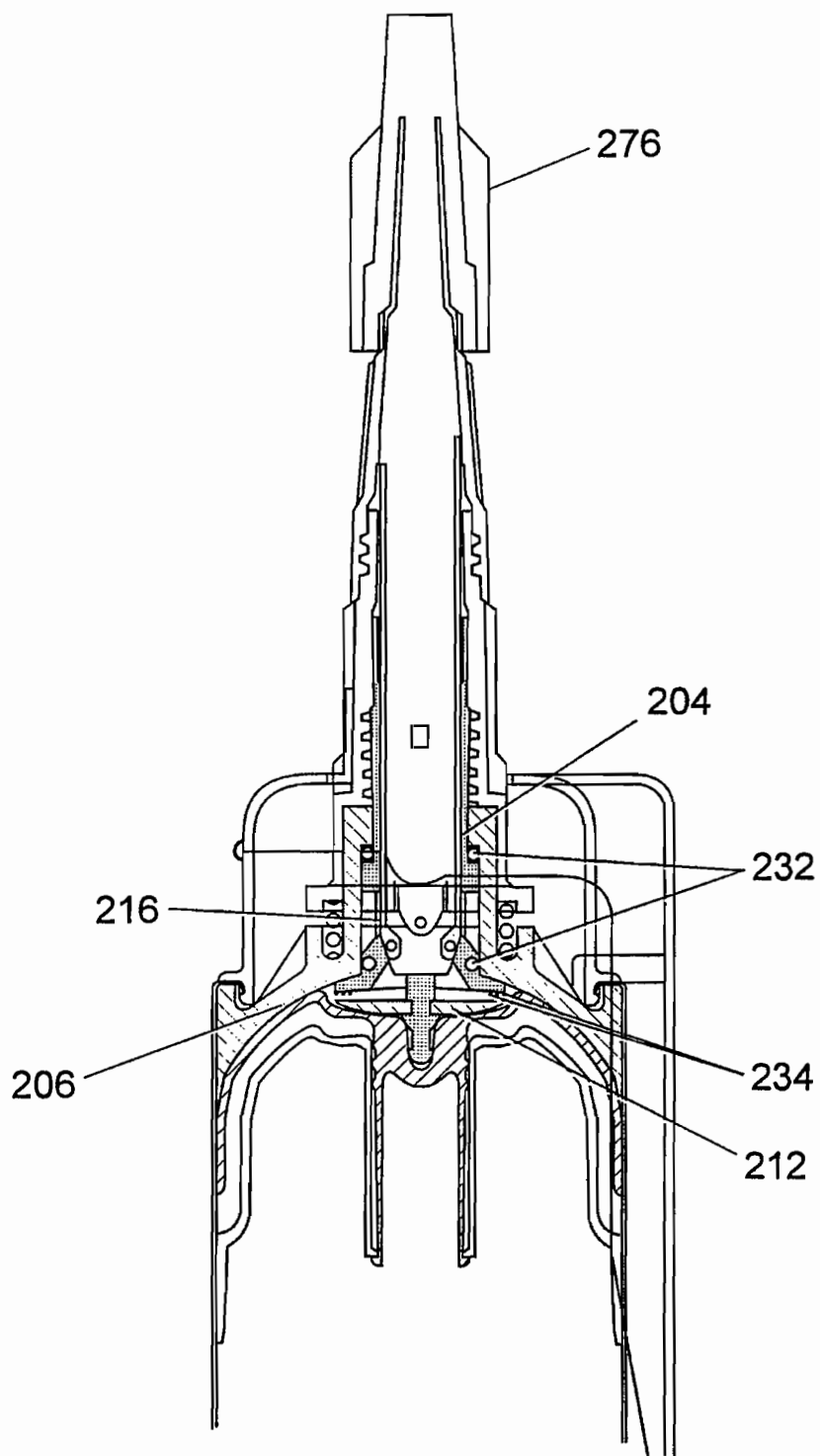


Fig. 3

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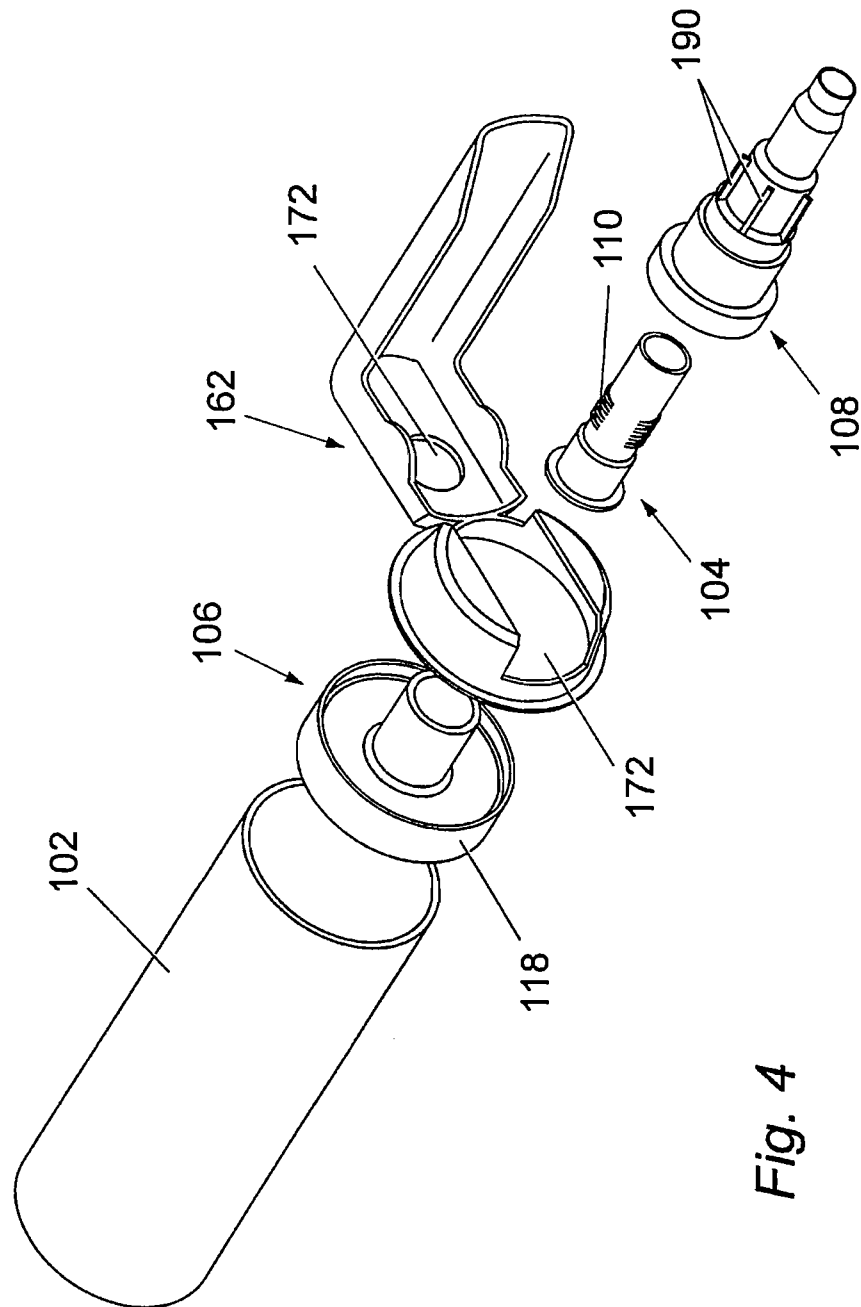


Fig. 4

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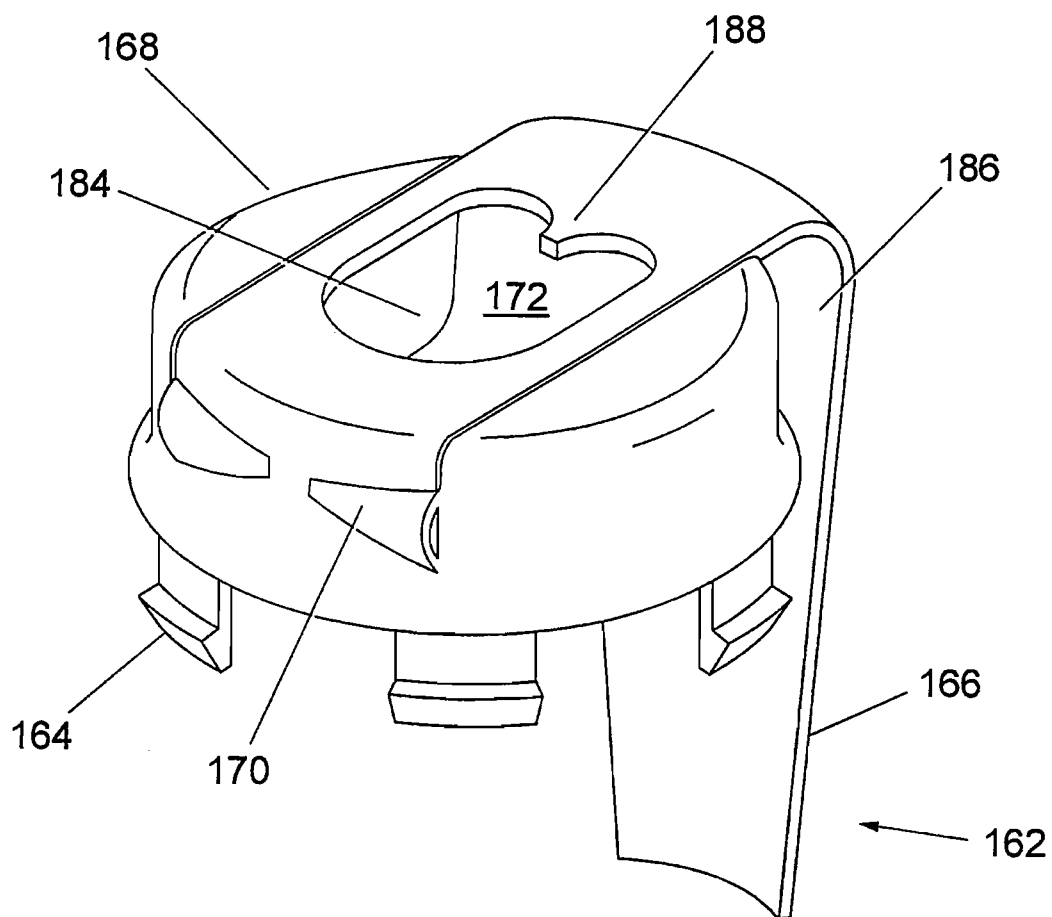


Fig. 5

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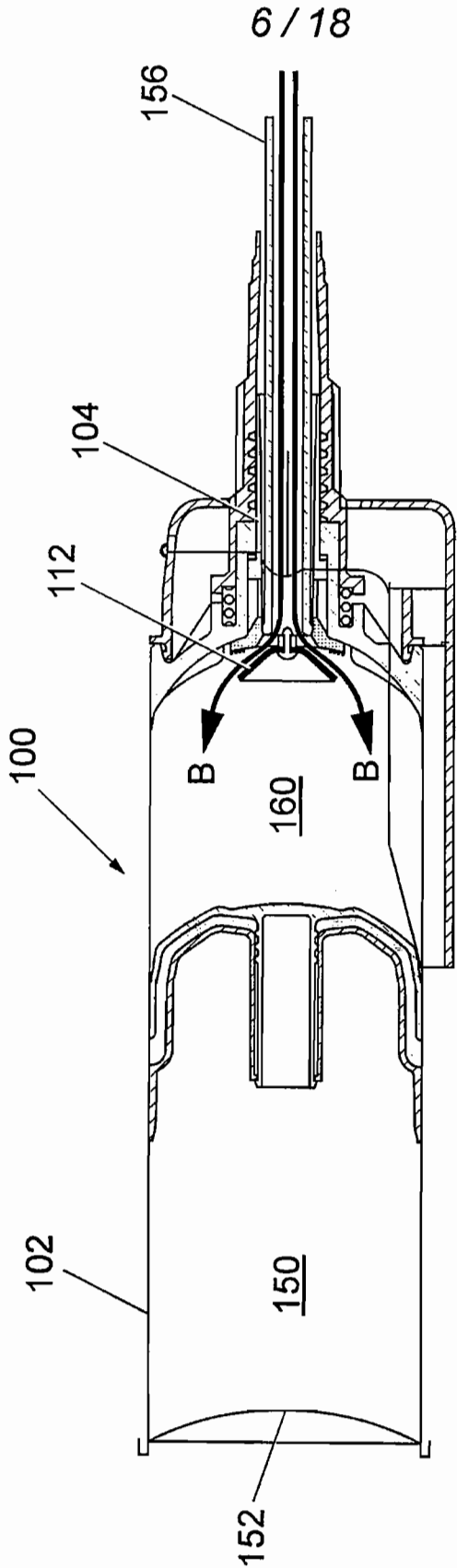


Fig. 6

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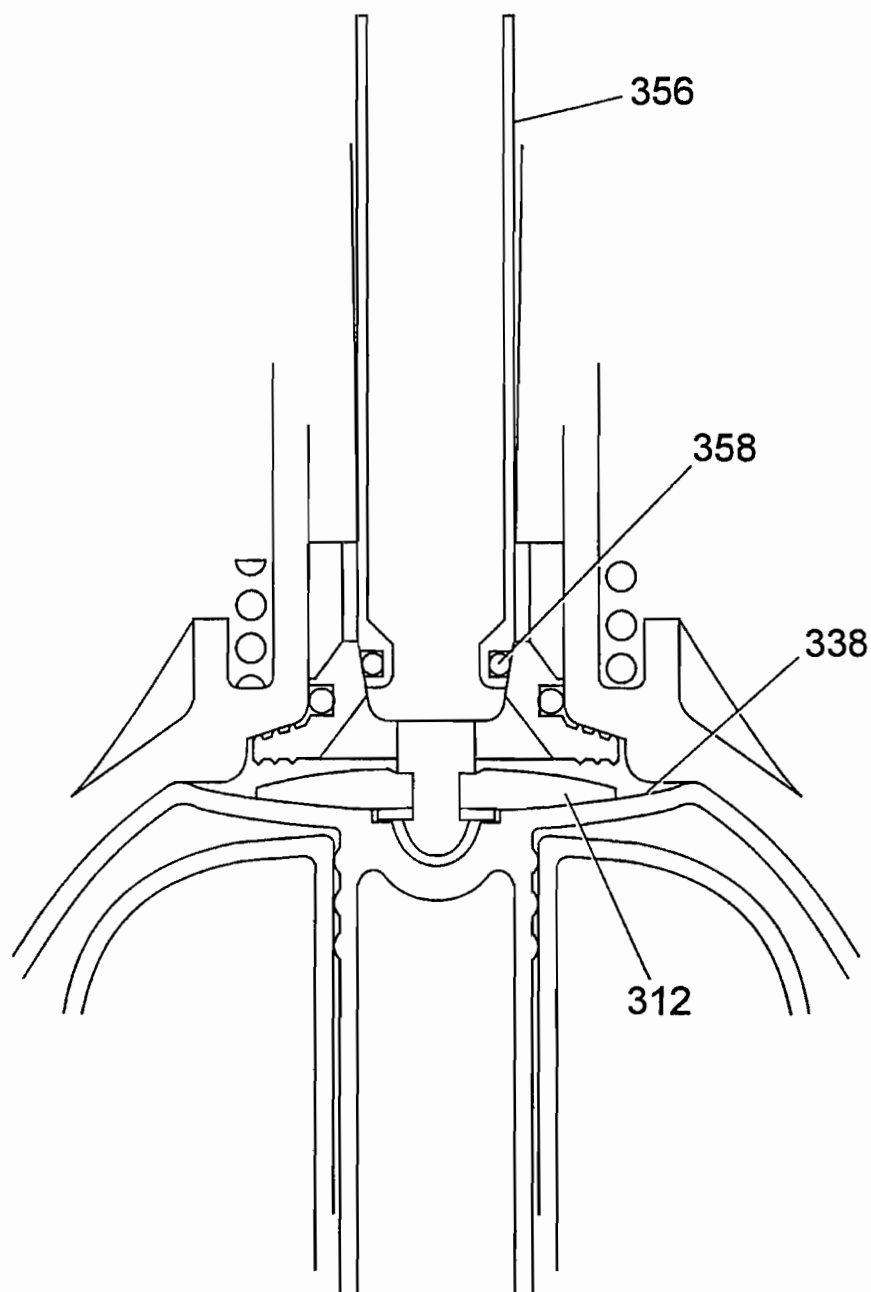


Fig. 7

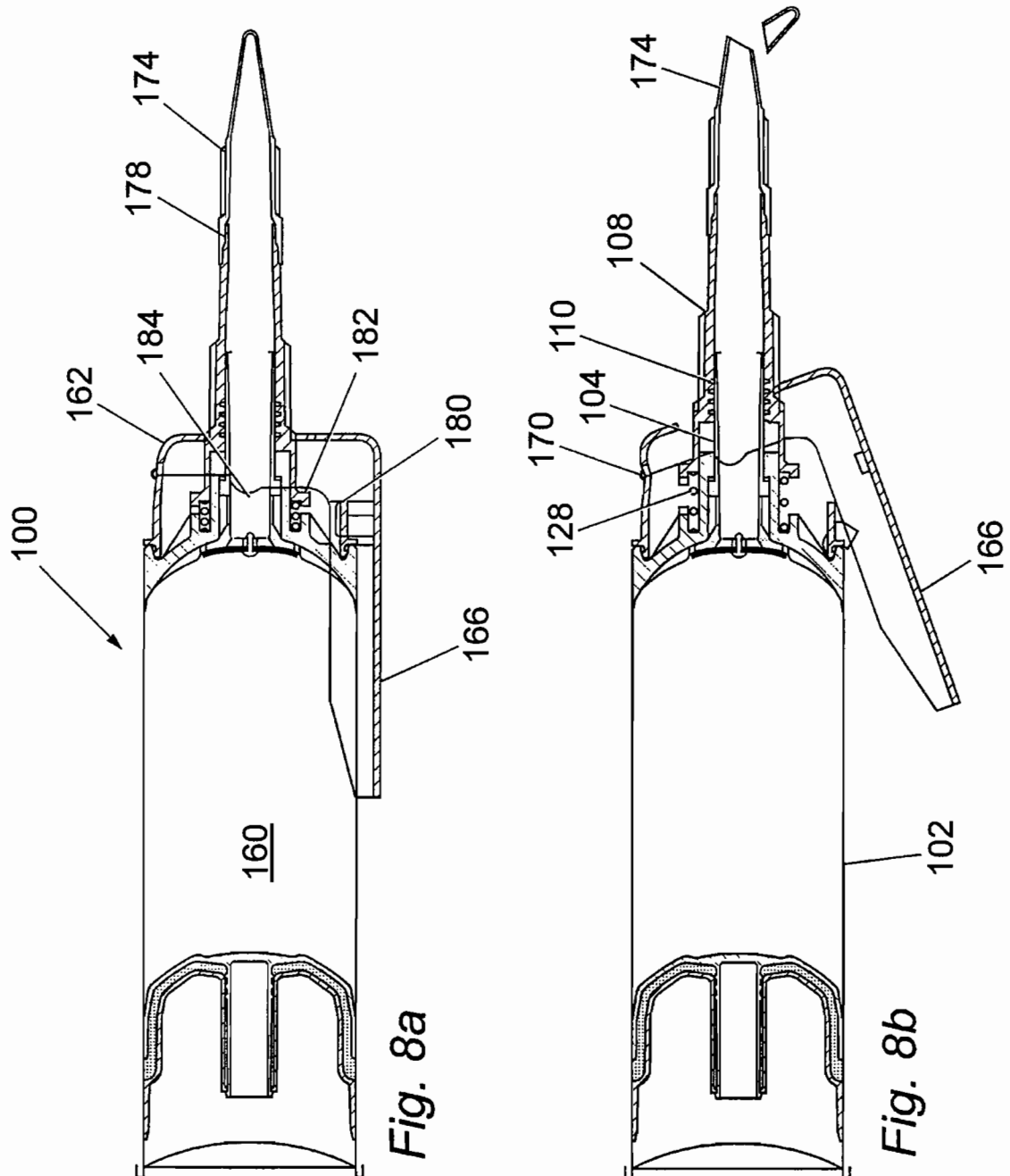
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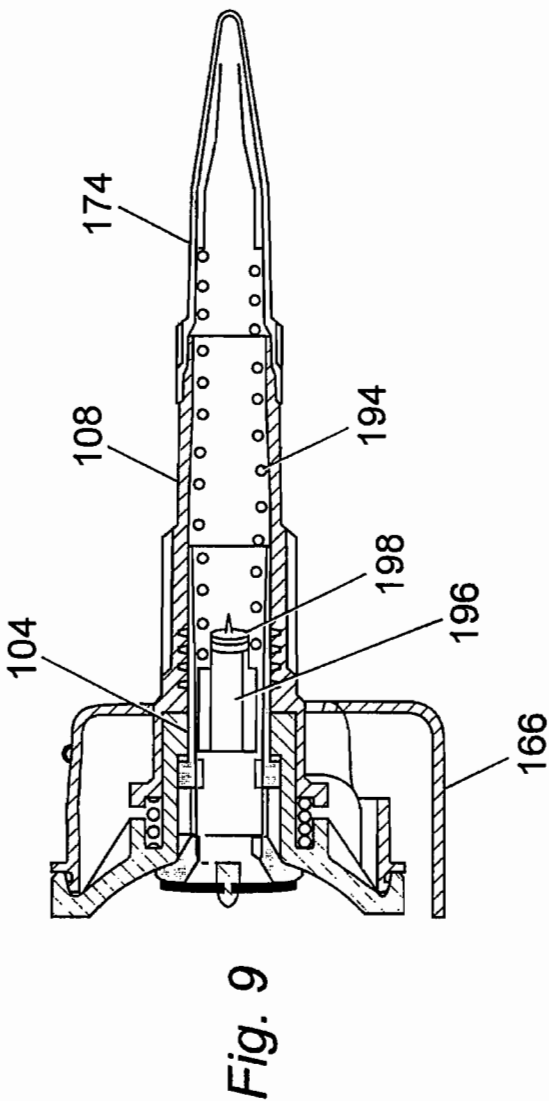
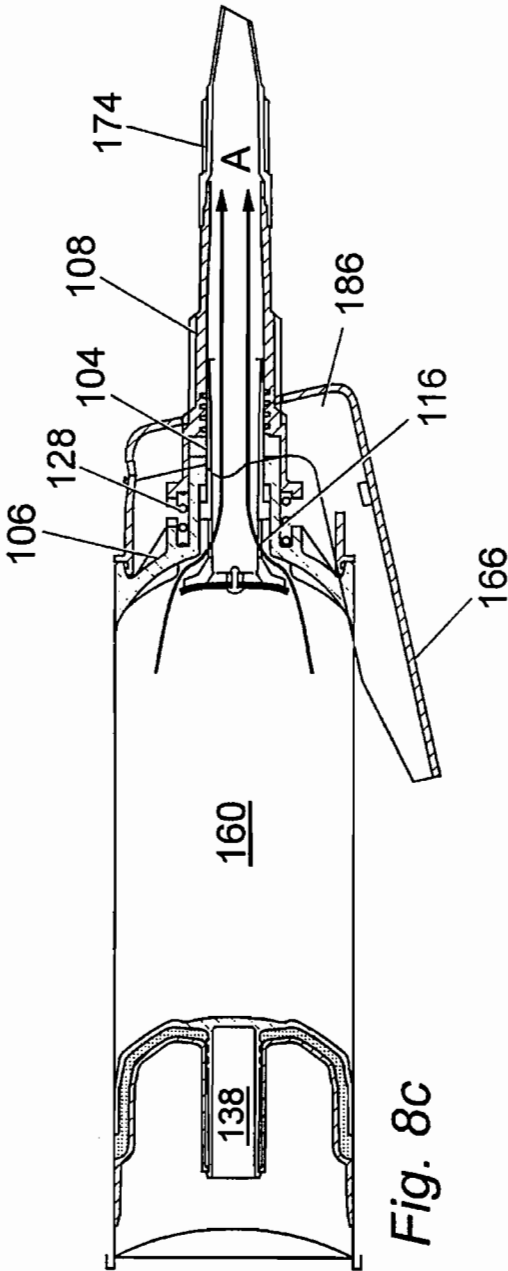
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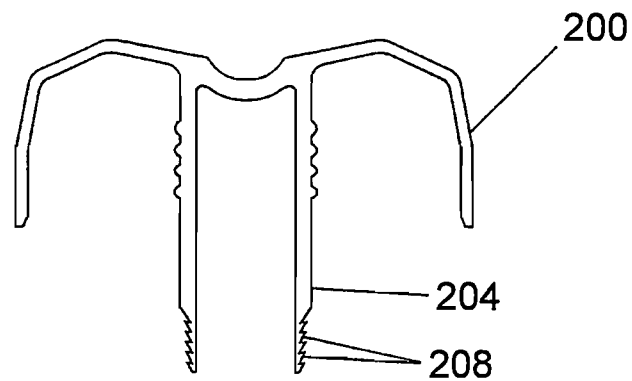


Fig. 10

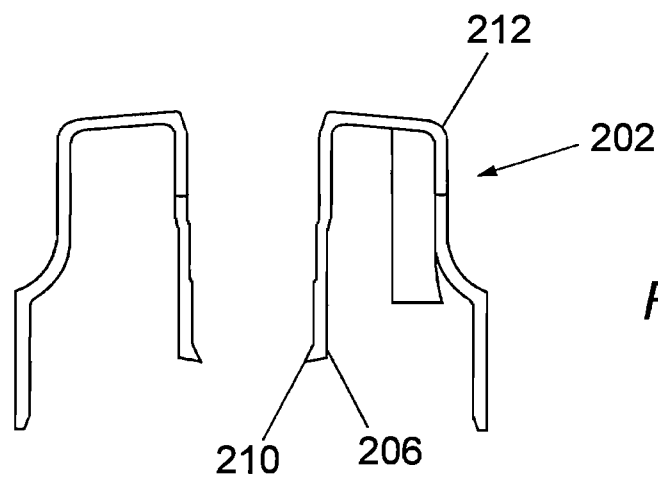


Fig. 11

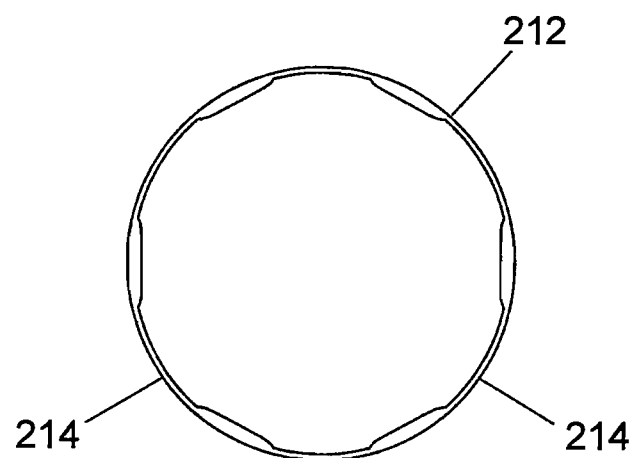


Fig. 12

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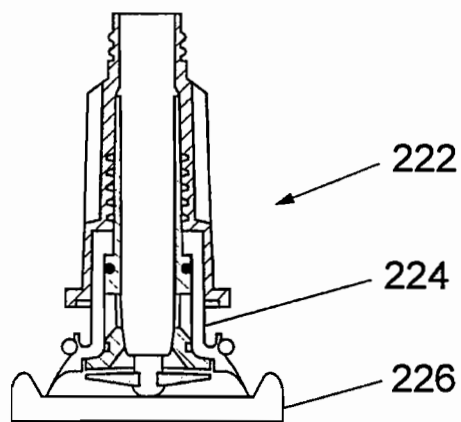
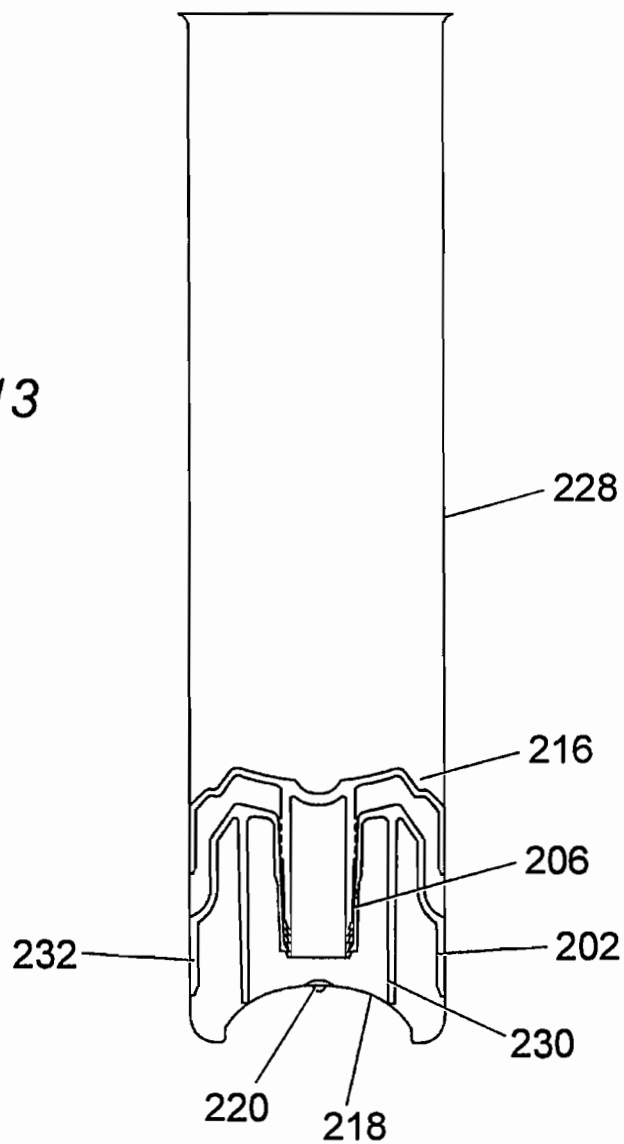


Fig. 13



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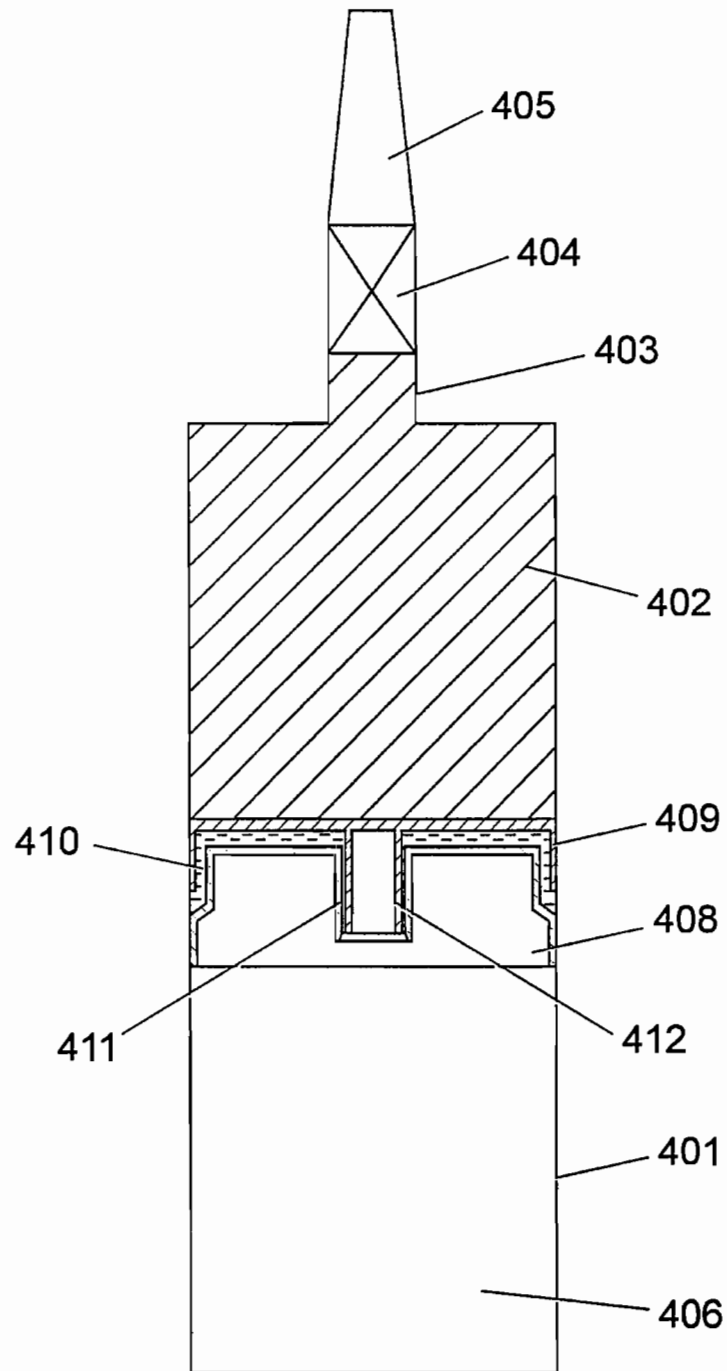


Fig. 14

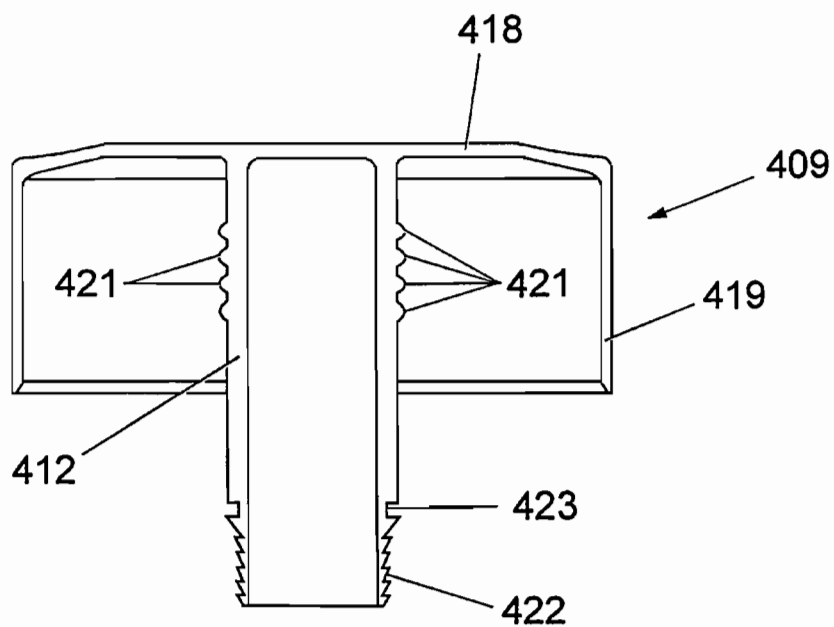
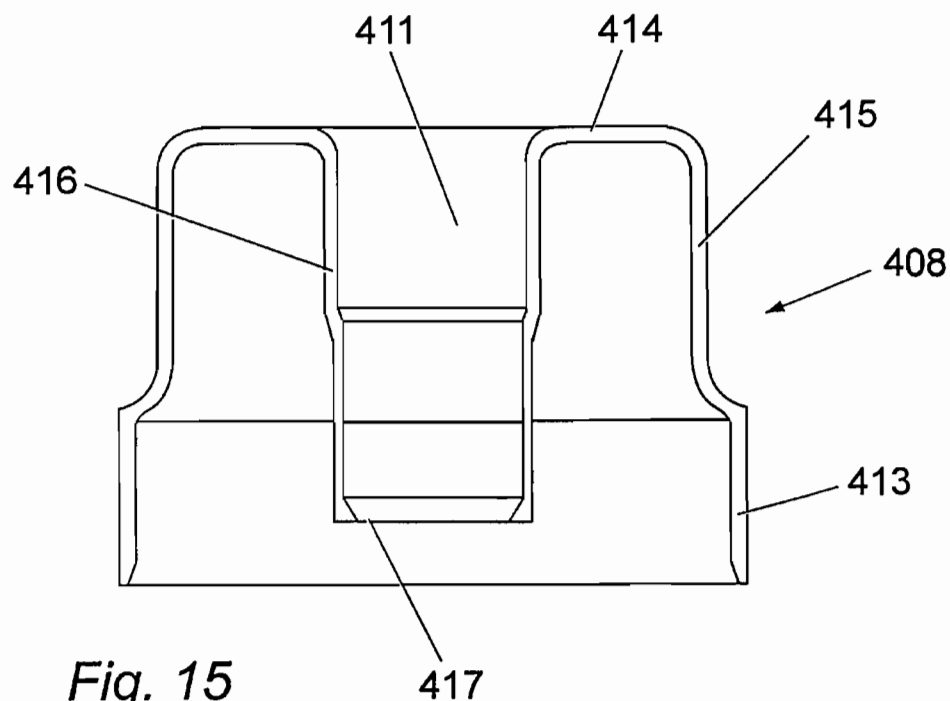
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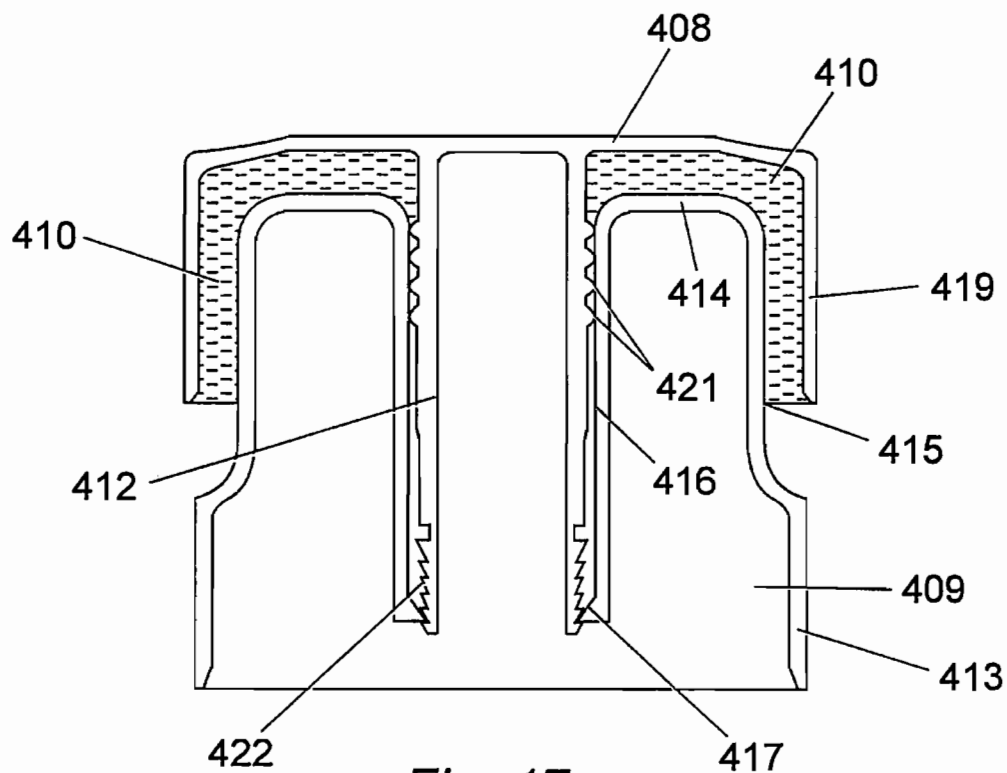


Fig. 17

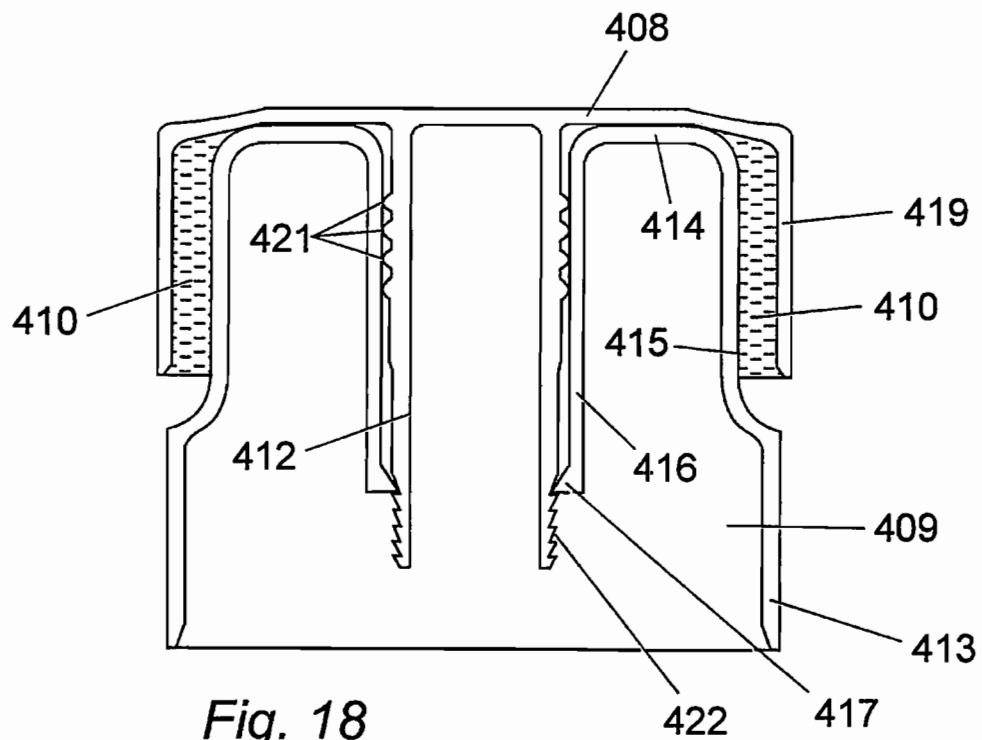


Fig. 18

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Fig. 19a

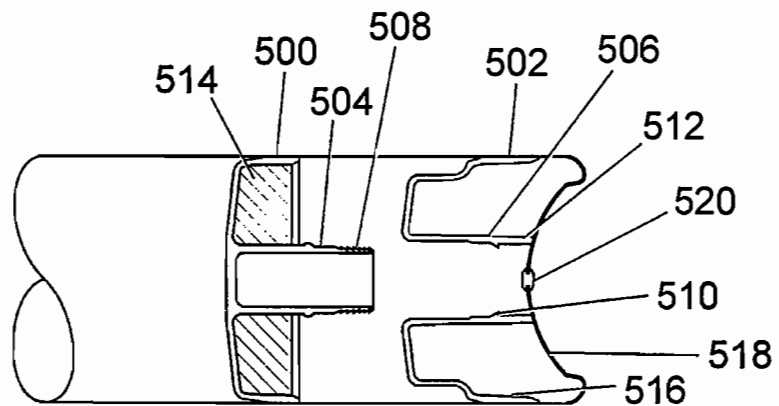


Fig. 19b

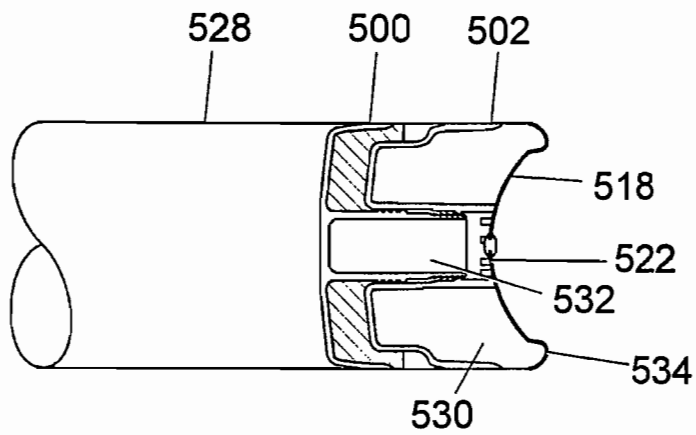


Fig. 19c

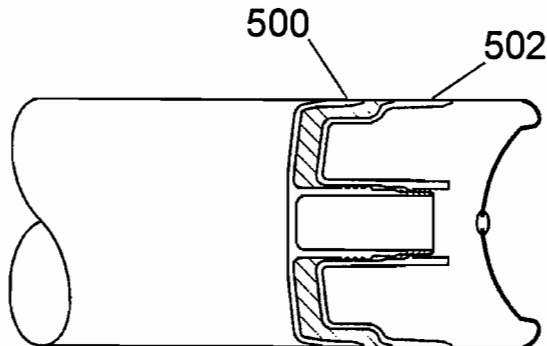
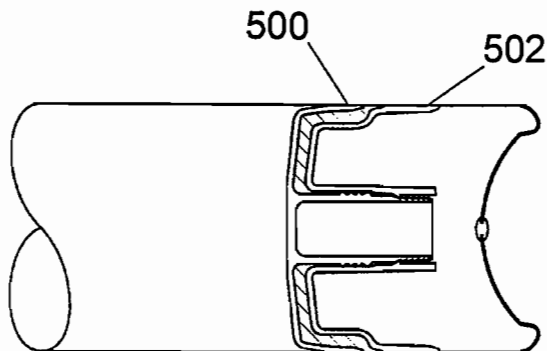


Fig. 19d



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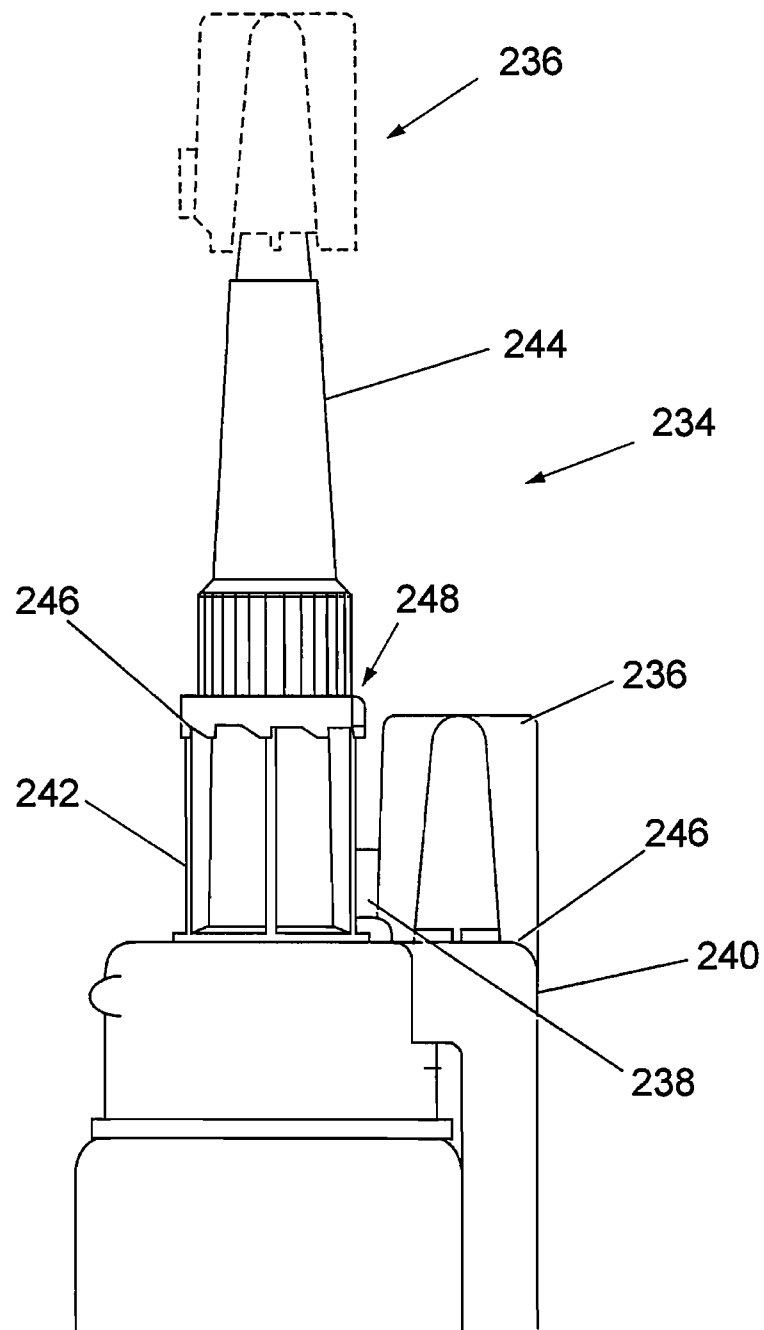


Fig. 20

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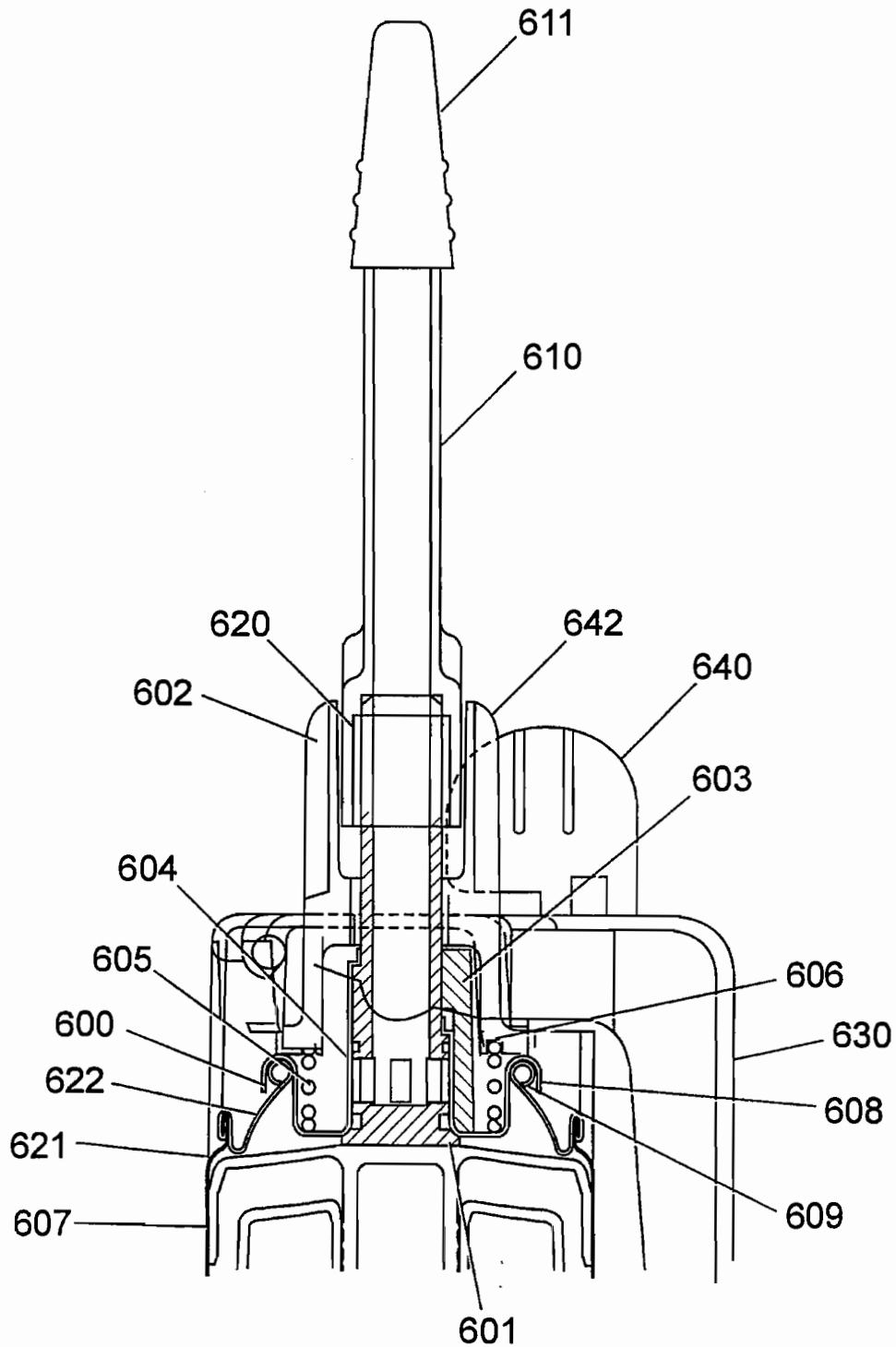


Fig. 21

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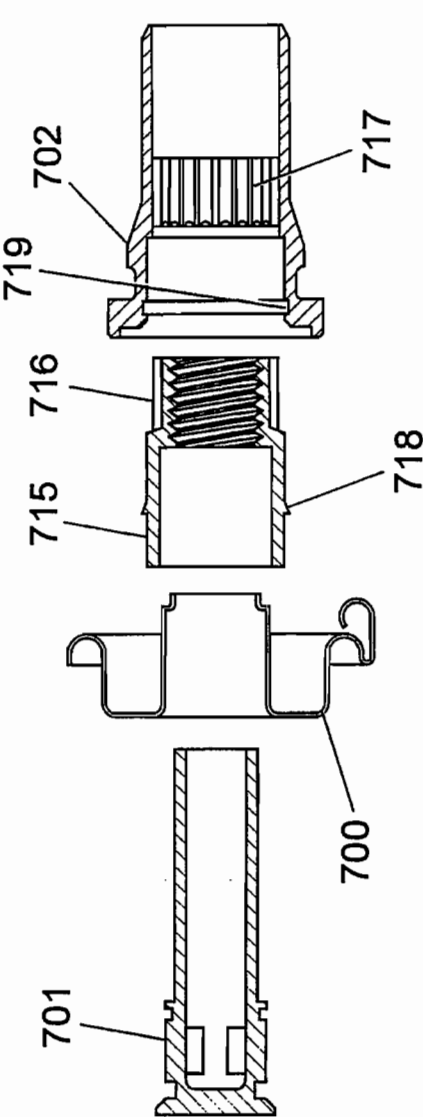


Fig. 22a

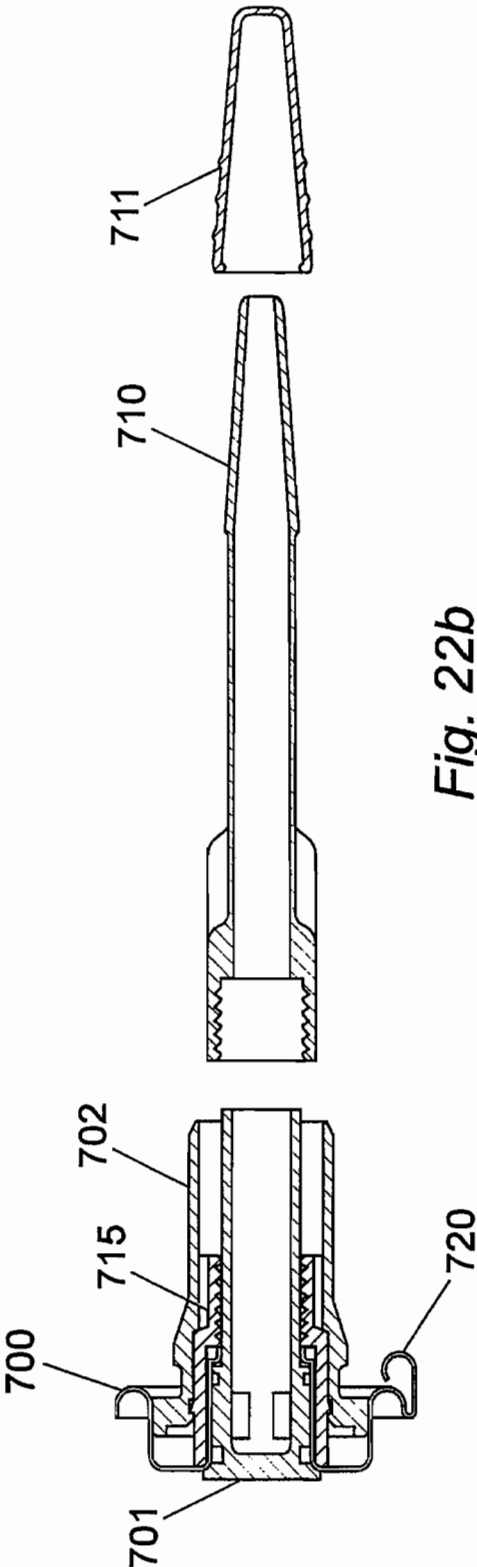


Fig. 22b

EXHIBIT B



US006820777B2

(12) **United States Patent**
Frutin

(10) **Patent No.:** **US 6,820,777 B2**
(45) **Date of Patent:** ***Nov. 23, 2004**

(54) **DISPENSING APPARATUS**

(75) **Inventor:** **Bernard Derek Frutin, Uplawmoor (GB)**

(73) **Assignee:** **Rocep Lusol Holdings Ltd., Deanpark (GB)**

(*) **Notice:** Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

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This patent is subject to a terminal disclaimer.

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(21) **Appl. No.:** **10/284,684**

(22) **Filed:** **Oct. 31, 2002**

(65) **Prior Publication Data**

US 2003/0052137 A1 Mar. 20, 2003

Related U.S. Application Data

(62) Division of application No. 10/169,290, filed as application No. PCT/GB00/04967 on Dec. 22, 2000, now Pat. No. 6,685,064.

(30) **Foreign Application Priority Data**

Dec. 30, 1999 (GB) 9930773

(51) **Int. Cl.⁷** **B65D 83/00**

(52) **U.S. Cl.** **222/402.15; 222/402.21; 222/153.12**

(58) **Field of Search** 222/402.15, 402.23, 222/402.21, 402.22, 402.14, 402.16, 402.25, 402.11, 153.12, 153.13, 153.14, 380, 389, 402.1, 402.2

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Primary Examiner—David A. Scherbel

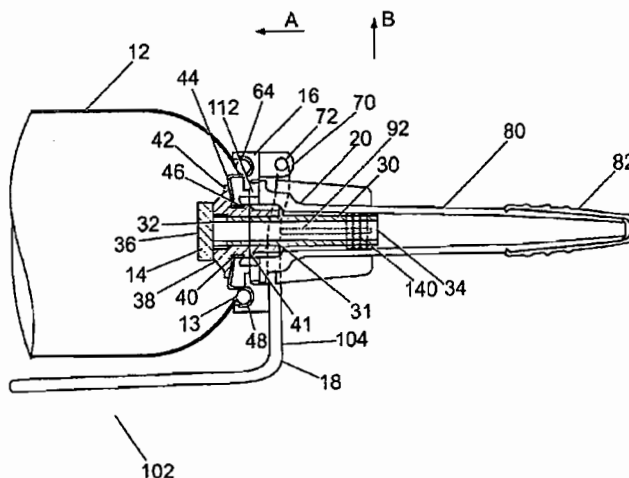
Assistant Examiner—Frederick C. Nicolas

(74) *Attorney, Agent, or Firm*—Drinker Biddle & Reath LLP

(57) **ABSTRACT**

A dispensing apparatus (10) for dispensing a product from a container (12) includes: a product chamber within the container (12); a valve (14) adjacent to the product chamber; a hinge assembly secured to the opening of the container and to which is connected a nozzle assembly (20); and a lever (18) attached by a hinge assembly. The nozzle assembly (20) is rotatable between open and closed positions and includes an actuator portion provided with a cam surface (96, 98) which co-operates with a bearing portion (100) on the lever (18) such that, when the nozzle assembly (20) is in the open position, operation of the lever (18) causes movement of the actuator portion to open the valve (14) and permit flow of the product out of the container (12).

15 Claims, 6 Drawing Sheets



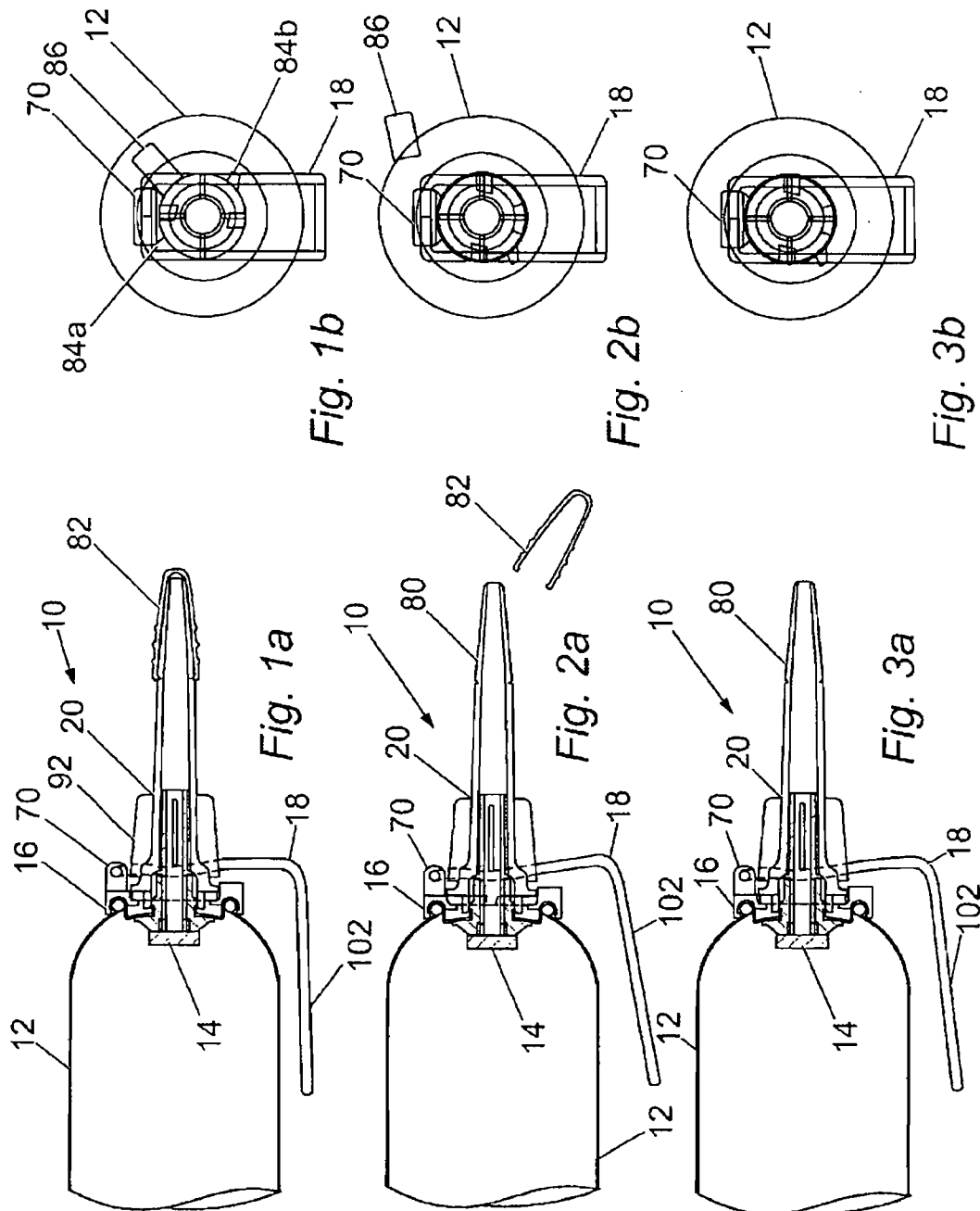
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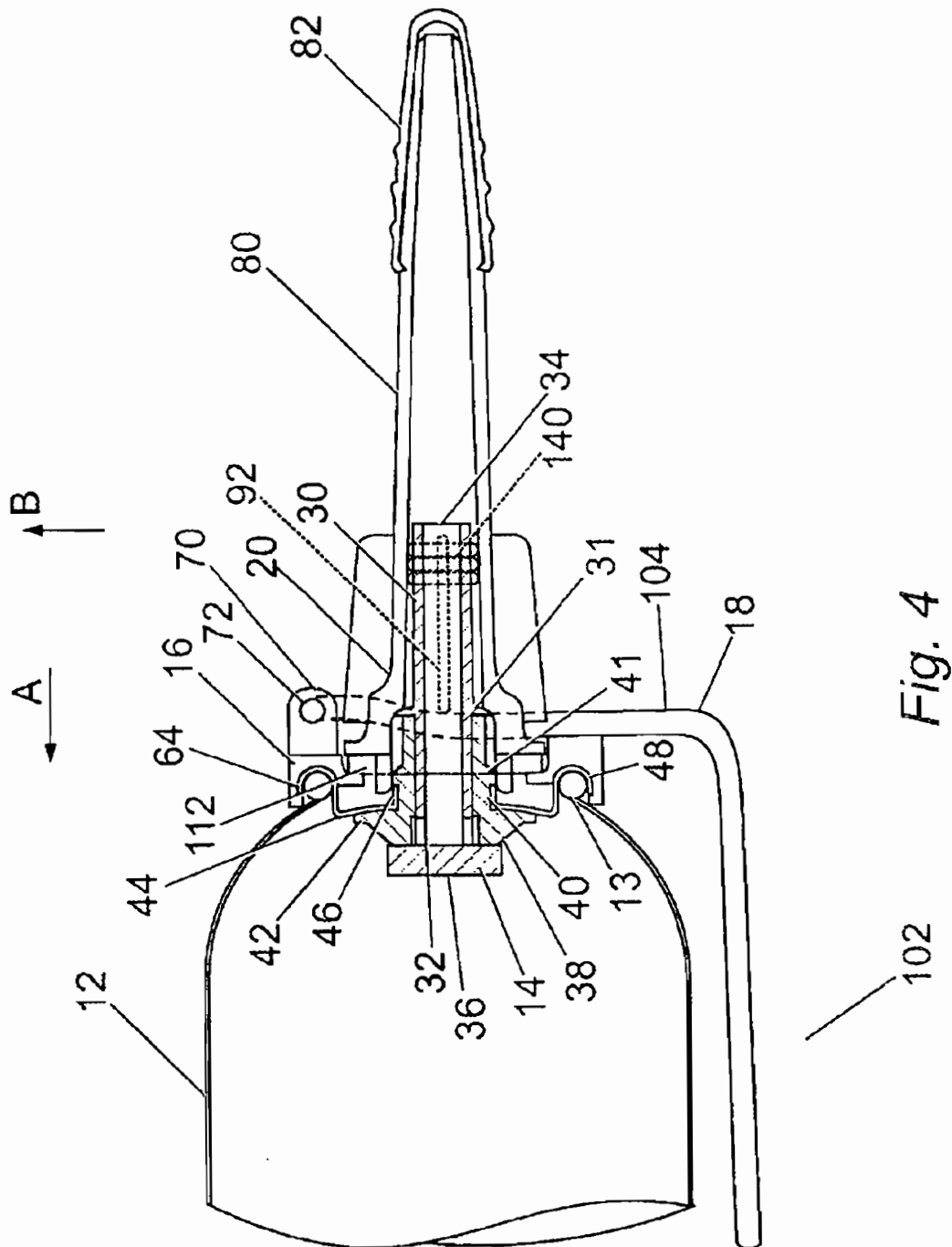
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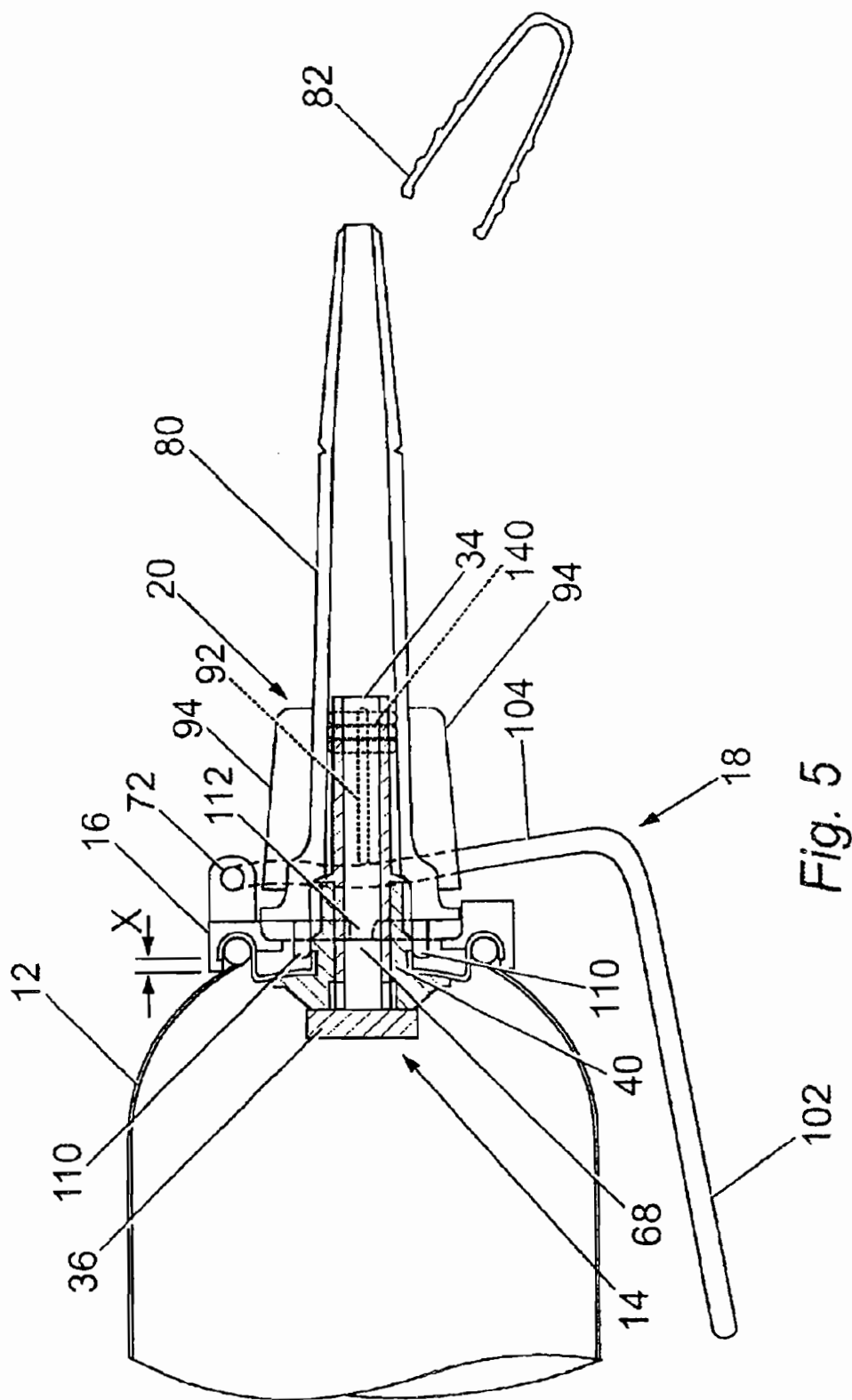


Fig. 5

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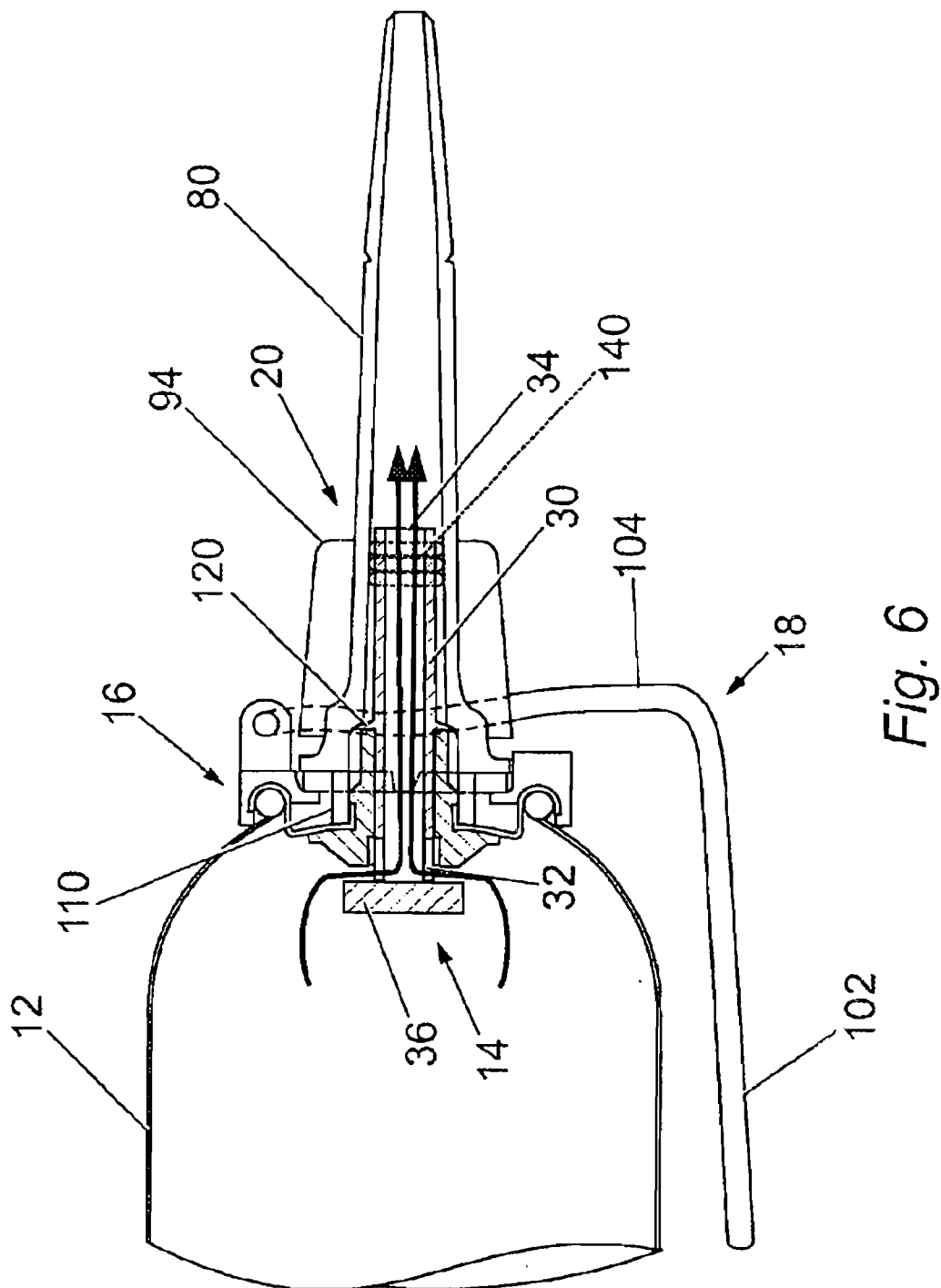
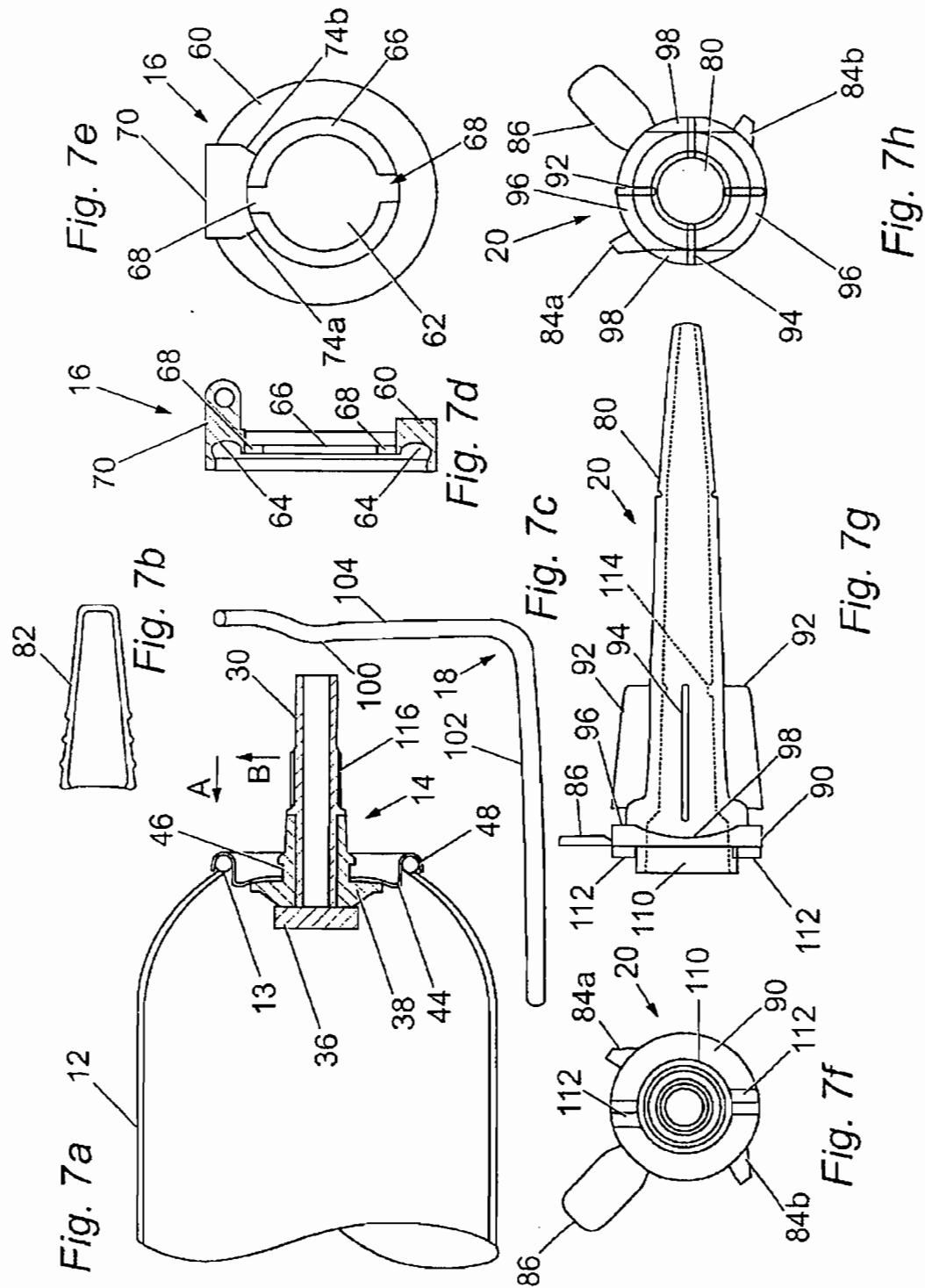


Fig. 6

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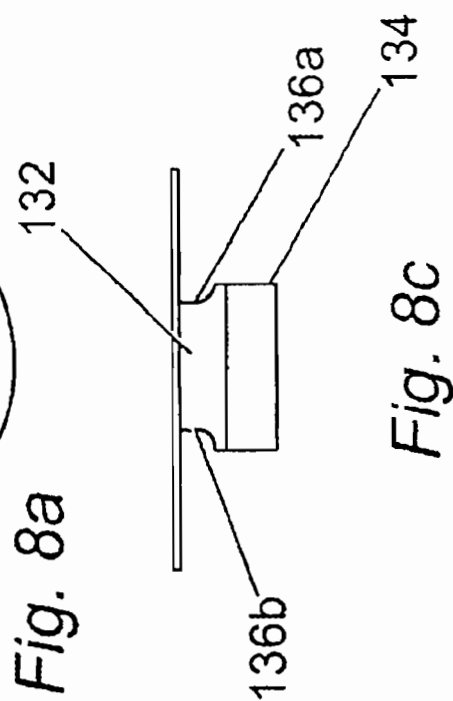
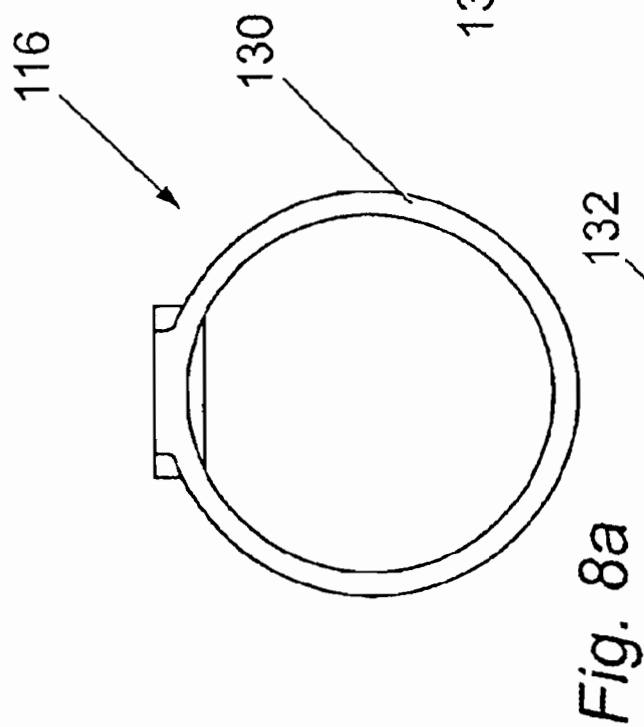
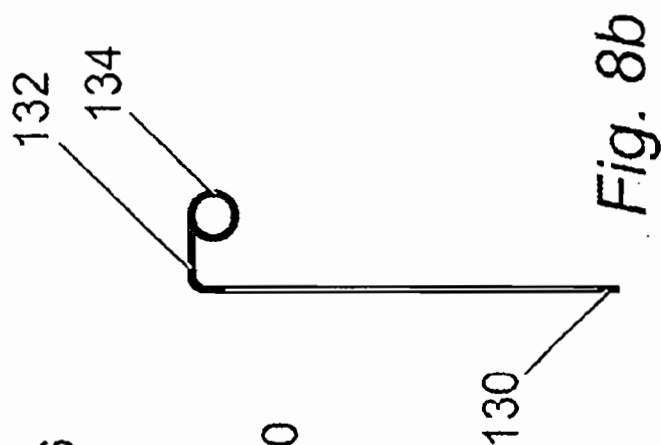


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1

DISPENSING APPARATUS

This application is a division of Ser. No. 10/169,290 filed Aug. 13, 2002; now U.S. Pat. No. 6,685,064 which is a 371 of PCT/GB00/04967 filed Dec. 22, 2000.

FIELD OF THE INVENTION

This invention relates to dispensing apparatus. Particularly, but not exclusively it relates to dispensing apparatus for dispensing viscous materials from a container under pressure of a propellant.

BACKGROUND OF THE INVENTION

Known dispensing apparatus commonly includes a valve mechanism fitted to a container which is refilled with a product, for example mastic or sealant, which is to be dispensed. Examples are disclosed in Patent document EP-B-0243393 (Rocep Lusol Holdings Limited). However, known arrangements have several disadvantages. For example, the cost of components used in the manufacture of such known apparatus is high. The valve mechanism comprises a large number of separate parts which must be assembled together. Automatic assembly of such apparatus is complicated and costly.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a dispensing apparatus which overcomes one or more of the above disadvantages.

According to the present invention there is provided a dispensing apparatus for dispensing a product from a container, said apparatus comprising:

- a product chamber within the container;
- a valve adjacent to the product chamber;
- a hinge assembly;
- a lever hingedly attached to the hinge assembly and having a bearing portion; and
- a nozzle assembly sealingly engageable with the hinge assembly, the nozzle assembly being rotatable between open and closed positions and including an actuator portion provided with a cam surface which cooperates with the lever bearing portion such that in the open position operation of the lever causes movement of the actuator portion to open the valve and permit flow of the product out of the apparatus.

Preferably the apparatus comprises means for urging the product from the product chamber. Preferably the product chamber is pressurised. The product chamber may contain a propellant. The product chamber may contain a piston, situated between the propellant and the valve.

Preferably the valve is a tilt valve. Tilt valves are generally known in dispensing apparatus and operate by tilting of a hollow central stem which is resiliently held on a mounting cup by a rubber grommet. The stem is closed at its lower end by a sealing plate. When the stem is tilted, the seal between the grommet and the sealing plate is broken and the product can reach apertures in the central stem and thence flow along the hollow stem.

Preferably the valve comprises a mounting cup adapted to secure the valve to the container. Preferably the container is provided with a rolled flange portion and the mounting cup is provided with a corresponding flange portion adapted to engage with the rolled flange portion of the container.

Preferably the actuator portion comprises a ring member arranged at a lower end of the nozzle assembly. Preferably

2

the cam surface comprises one or more depressions and one or more raised surfaces. Preferably when the nozzle assembly is in the closed position the lever bearing portion is adapted to bear upon one of said depressions, and when the nozzle assembly is in the open position the lever bearing portion is adapted to bear upon one of said raised surfaces.

Preferably the lever comprises two lever bearing portions arranged at opposite sides of the valve. Preferably the cam surface comprises two depressions arranged at opposite sides of the ring and two raised surfaces arranged between the depressions at opposite sides of the ring.

Preferably the nozzle assembly is provided with means to limit the rotational travel of the nozzle assembly between the closed position and the open position. These means may comprise two end stops provided on the nozzle assembly adapted to locate against an upstand on the hinge assembly.

The nozzle assembly may be provided with fin members adapted to hold the lever bearing portion against the cam surface. The fin members may be of different lengths. Preferably a fin member is provided at each depression and each raised surface of the cam surface, spaced from the cam surface to allow the insertion of the lever bearing portion between the fin member and the cam surface.

Preferably the nozzle assembly comprises one or more dog teeth and the hinge assembly comprises one or more slots, adapted such that a dog tooth can enter a slot only when the nozzle assembly is in the open position. The nozzle assembly is preferably coupled to the valve stem for longitudinal movement, such that movement of the nozzle assembly towards the container causes the dog tooth to enter the slot and the valve stem to move, thereby opening the valve to release the product.

Preferably, the container is made substantially from aluminium and is most preferably an aluminium monoblock container. Alternatively the container may be a wall ironed tin plate can, or an extruded tin plate can as used in the beverage industry, without a side seam.

BRIEF DESCRIPTION OF THE DRAWINGS

Specific embodiments of the invention will now be described, by way of example only, with reference to the accompanying drawings in which:

FIGS. 1(a) and 1(b) are a side view in cross-section and an end view respectively of a dispensing apparatus in accordance with an embodiment of the present invention in a closed position;

FIGS. 2(a) and 2(b) are a side view in cross-section and an end view respectively of the dispensing apparatus of FIGS. 1(a) and 1(b) in an open position with the valve closed;

FIGS. 3(a) and 3(b) are a side view in cross-section and an end view respectively of the dispensing apparatus of FIGS. 1(a) and 1(b) in an open position with the valve open;

FIG. 4 is an enlarged view of the valve area of the apparatus of FIG. 1(a);

FIG. 5 is an enlarged view of the valve area of the apparatus of FIG. 2(a);

FIG. 6 is an enlarged view of the valve area of the apparatus of FIG. 3(a);

FIGS. 7(a), 7(b), 7(c) and 7(d) are sectional views of the valve, nozzle end cap, lever and hinge assembly respectively of the apparatus of FIG. 1(a);

FIG. 7(e) is an end view on the hinge assembly of FIG. 7(d);

FIGS. 7(f), 7(g) and 7(h) are a bottom view, side view and top view respectively of the nozzle assembly of the apparatus of FIG. 1(a); and

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FIGS. 8(a), 8(b) and 8(c) are a bottom view, sectional side view and front view respectively of a hinge assembly of an apparatus according to a second embodiment of the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring to FIGS. 1 to 7 of the accompanying drawings, an apparatus in accordance with an embodiment of the present invention will be described. The apparatus will be referred to hereinafter as a "pressure pack" or "pack". The pressure pack of FIGS. 1 to 3 is generally denoted 10.

The pack 10 consists generally of a canister section and a valve section.

In this example, the canister section 12 comprises an aluminium monoblock container of the sort widely used in aerosol applications. It is envisaged that the can 12 could be of tin plate, steel or any conventional can construction having a standard one inch (25 mm) hole in the top. The can may be internally lacquered.

The pack 10 is automatically assembled as follows. Firstly a sub-assembly is formed from a valve 14, a hinge assembly 16, a lever 18 and an actuating nozzle 20. The valve is a tilt valve of the type widely used in pressurised dispensers and operated by tilting the valve stem 30. The valve stem 30 is a hollow plastic tube with apertures 32 in the tube wall at the lower end. The upper end 34 is open, while the lower end is closed by a plastic sealing disc 36. A resilient grommet 38 of rubber or synthetic material surrounds the lower portion of the stem 30 and is held in place by the sealing disc 36 and a retaining collar 31 formed on the outside of the stem 30.

The grommet 38 is provided with a circumferential groove 40 and a sealing web 42 which house a mounting cup 44 of metal. The mounting cup has an inner flange 46, which sits sealingly inside the groove 40 on the grommet, and an outer flange 48 which is adapted to fit around a rolled flange 13 which extends around the opening of the container 12. When the stem 20 is pushed in the direction of arrow A relative to the mounting cup 44, the sealing disc 36 is pushed away from the grommet 38, and material in the canister 12 is free to pass between the sealing disc 36 and grommet 38, through the apertures 32, along the inner bore of the stem 30 and through the open end 34 of the stem. When the stem is released, the resilience of the grommet 38 pushes the stem back in a direction opposite to arrow A and seals the valve again. If the stem is pushed to one side in the direction of arrow B, one side of the sealing disc 36 is pushed away from the grommet 38, and material in the canister 12 is again free to pass between one side of the sealing disc 36 and grommet 38, through the apertures 32, and out of the stem 30.

The hinge assembly can be seen more clearly in FIGS. 7(d) and 7(e). The hinge assembly 16 is moulded from plastic and comprises a ring 60 having a central aperture 62. The ring 60 is provided with a circumferential groove 64 adapted to snap on to the outer flange 48 of the mounting cup. A discontinuous flange 66 projects into the aperture 64, forming two slots 68, whose purpose is explained later. An upstand 70 is provided with a through bore 72 adapted to house the ends of a wire lever 18, thereby forming a hinge for the lever. The lever 18 comprises a handle 102, which extends along the side of the canister 12, and a lever arm 104. The lever 18 is preferably formed from a single piece of wire, whose two free ends are mounted in opposite sides of the upstand 70.

The nozzle assembly 20 comprises an elongate tapering nozzle 80 with a removable end cap 82, which may be

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click-fit, screw-fit or simple taper fit. The nozzle assembly is free to rotate about its longitudinal axis relative to the hinge assembly 16 and lever 18.

In the illustrated embodiment of FIGS. 1 to 7 the rotation is limited by two end stops 84a and 84b, which come into contact with bevelled contact surfaces 74a and 74b formed on the upstand 70 of the hinge assembly 16. When end stop 84a is in contact with surface 74a, the nozzle is in the closed position. When the nozzle is rotated by 45° in a counter-clockwise direction, so that end stop 84b is in contact with surface 74b, then the nozzle is in the open position.

When the dispenser is transported and is stored before first use, a removable tab 86 attached to the base 90 of the nozzle assembly prevents any rotation of the nozzle from the closed position by bearing on contact surface 74b on the upstand 70. Only after removal of the tab, by folding and snapping or tearing, can the nozzle be rotated in a counter-clockwise direction. It is to be understood that the provision of a locking tab 86 is optional, and the invention may function without a locking tab.

The nozzle assembly is provided with four fins, two shorter fins 92 and two longer fins 94. The base 90 of the nozzle serves as an actuator to control the opening of the valve and is provided with a cam surface which has two depressions 98 adjacent to the longer fins 94 and two raised surfaces 96 adjacent to the shorter fins 92. The lever arm 104 of the lever 18 has a bearing portion 100 which is adapted to fit between the longer fin 94 and the depression 98 when the nozzle assembly is in the closed position. Upon rotation of the nozzle assembly, the longer fin moves away from the bearing portion 100, so that the bearing portion 100 is free to rise, and the cam surface pushes the bearing portion up until it is raised to the level of the raised surface 96, where it is held between the shorter fin 92 and the raised surface 96.

As the bearing portion 100 is raised, the handle 102 on the lever 18 is moved away from the side of the canister 12, from the position shown in FIG. 1(a) to that shown in FIG. 1(b).

In an alternative embodiment of the invention, not illustrated, the end stops on the nozzle assembly are omitted. The nozzle assembly is provided with an internal thread which mates with an external thread on the valve stem 30. The nozzle assembly is secured to the valve stem by turning in a clockwise direction until the shoulder 120 on the inside of the nozzle bears on the collar 31 on the outside of the valve stem. Further rotation of the nozzle assembly in a clockwise direction causes both the nozzle assembly 20 and the valve stem 30 to rotate together relative to the grommet 38 and can 12. The base of the nozzle has a cam surface, as described previously, but the nozzle assembly does not stop automatically when the open position is reached. A first rotation in the clockwise direction brings the nozzle to the open position, while further rotation in the clockwise direction brings it back to the closed position, and so on.

Referring again to FIGS. 1 to 7, the base 90 of the nozzle is provided with a cylindrical extension 110 which has an internal diameter adapted to fit slidably around the inner flange 46 of the mounting cup 44. The inner surface of the cylindrical extension 110 engages with a protruding part 41 of the grommet 38 adjacent to the groove 40, to form a seal which prevents the product passing between the valve 14 and the nozzle 80.

Arranged outside the extension 110 are two dogs 112, which in the closed position of the nozzle are aligned on top of the flange 66 in the hinge assembly. In this position the nozzle assembly 20 cannot be moved in the direction of

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arrow A relative to the hinge assembly 16, because the dogs 112 will interfere with the flange 66. However, when the nozzle is rotated to the open position the dogs 112 are aligned with the slots 68 formed by the gaps in the flange 66, and the nozzle assembly 20 can be moved in the direction of arrow A, so that the dogs 112 enter the slots 68.

It is to be understood that the nozzle assembly may be provided with only one dog 112, and the hinge assembly with only one slot 68.

When the nozzle assembly is in the open position, as in FIGS. 2 and 3, then depression of the handle 102 towards the canister 12 causes the bearing portion 100 of the lever 18 to push the nozzle assembly 20 in the direction of arrow A towards the hinge assembly 16. The nozzle assembly is linked to the valve stem 30 to prevent relative longitudinal movement of the valve 14 and nozzle 80. The linking means may comprise a thread or a rib and groove arrangement. In the example of FIGS. 4 to 6 three seals 140 are provided on the outer bore of the valve stem 30. These seals 140 seal between the valve stem 30 and the nozzle 80 and prevent product being forced back down between the valve stem 30 and nozzle 80 by back pressure in the nozzle 80.

An alternative method of sealing is shown in FIG. 7, in which the inside of the nozzle 80 is provided with an annular projection 114 which seals between the nozzle 80 and the valve stem 30 to prevent any product passing between the nozzle 80 and the valve stem 30. An external thread 116 is provided on the valve stem 30 which engages with a corresponding internal thread (not shown) on the nozzle 80 to prevent relative longitudinal movement of the valve 14 and nozzle 80.

As can be seen in FIG. 6, a shoulder 120 on the inside of the nozzle 20 bears on the collar 31 on the outside of the valve stem 30 and pushes the valve stem against the resilience of the grommet 38 in the direction of Arrow A. This causes the disc 36 to move away from the grommet and allow product to be expelled under pressure from the canister through the nozzle 80.

The nozzle assembly 20 is a single moulded piece of plastic. The nozzle assembly 20, the hinge assembly 16 and the lever 18 can be preassembled to form a complete nozzle/hinge sub-assembly and then secured to the canister 12 during the filling process. The nozzle/hinge sub-assembly of the invention is much simpler and cheaper than prior art sub-assemblies, because it uses only three components. The valve, being an off the shelf tilt valve having only three parts, namely the stem 30, grommet 38 and mounting cup 44, may be obtained cheaply and easily. In practice the container is filled, the valve 14 is secured to the container by crimping the flange 48, then the nozzle/hinge assembly is snapped onto the mounting cup of the valve.

The stroke of the valve is limited by the clearance X between the lower end of the extension 110 and the top of the mounting cup 44 adjacent to the inner flange 46. The length of the extension 110 is therefore carefully chosen depending on the flow characteristics of the product to be dispensed. Before filling the can 12 with product and before fitting the valve and nozzle/hinge assembly, a piston assembly (not shown) is inserted into the can 12. A suitable piston assembly is described in our co-pending International Patent Application No PCT/GB98/03003. However the piston assembly does not form part of the present invention, and any suitable automatic or manual pressure inducing arrangement may be used in connection with the apparatus of the present invention, including conventional aerosol cans.

To dispense a product, the tab 86 is broken, the end cap 82 is removed and the nozzle 80 may be cut open, if it is not

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supplied already open. The nozzle assembly 20 is then twisted relative to the hinge assembly 16. Twisting is made easy by the provision of the four fins 92, 94, which are readily grasped by hand. A 90° turn will fully open the pack. As the nozzle assembly 20 turns, the lever handle 102 lifts on the hinge 72 due to the action of the camming surface 96, 98 against the bearing portion 100 of the lever arm 104. This can be seen in the view of FIG. 2(a) and 2(b).

To dispense product, a user then presses down on the lever handle 102 (moving it toward the body of the can 12). This pushes the nozzle assembly 20 and valve stem 30 down relative to the hinge assembly 16, as described above. This is the position seen in FIGS. 3(a) and 3(b). Product is then urged to flow, by virtue of the internal pressurisation of the pack through the ports 32 and up through the valve stem 30 and out through the nozzle 80.

To stop dispensing, the user simply releases the lever handle 102. This closes the valve by allowing the valve stem 30 to slide back and close access through the ports 32.

Although FIGS. 1 to 7 show a simple camming surface in which there are two positions, a closed position in which the valve is fully closed and the dog cannot locate in the slot, and an open position in which the valve is fully open and the dog can locate in the slot, it is in the scope of the present invention to provide a more sophisticated camming surface, which may provide intermediate raised surfaces, whose height is between that of the depression 98 and highest raised surface 96. Further slots may be provided in flange 66 corresponding with the intermediate camming surfaces, so that the valve may be actuated in one or more intermediate, partially open positions. Alternatively the dogs 112 and flange 66 may be omitted, thereby simplifying the operation of the apparatus so that the valve can be actuated in any rotational position of the nozzle, the degree of rotation determining the extent to which the valve will open when actuated. Detent grooves may be provided in the camming surface, adapted to cooperate with the bearing portion 100 of the lever, to give a positive click action when the nozzle is rotated to an open position.

FIG. 8 shows an alternative form of hinge assembly 116, made of steel, alloy or other metal. The assembly comprises a ring 130 which fits around the rolled flange 13 of the container 12 before the mounting cup 44 of the valve 14 is fixed to the flange 13. Fixing the mounting cup holds the ring 130 in place. The upstand 132 and hinge 134 are formed by bending the single flat sheet of metal from which the hinge assembly 116 is formed. The bearing surfaces 136a, 136b at the end of the upstand 132 serve the same purpose as the bearing surfaces 74a, 74b described above with reference to FIGS. 7(d) and 7(e).

Modifications and improvements may be made to the foregoing without departing from the scope of the invention. In particular the dog mechanism may be omitted if there is another means of ensuring that the nozzle is not accidentally depressed, for example the provision of an outer cap which fits over the whole assembly on to the top of the canister. Similarly the fins may be omitted, and the lever may be retained in some other way, or may be free to rise away from the cam surface.

What is claimed is:

1. A dispensing apparatus for dispensing a product from a container, said apparatus comprising:

- a container
- a product chamber within the container;
- a valve adjacent to the product chamber;
- a hinge assembly attached to the container;

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- a lever hingedly attached to the hinge assembly and comprising a bearing portion; and
- a nozzle assembly sealingly engageable with the hinge assembly, the nozzle assembly being rotatable between open and closed positions of said nozzle assembly and including an actuator portion provided with a cam surface which cooperates with the lever bearing portion such that in the open position of said nozzle assembly operation of the lever causes movement of the actuator portion to open the valve and permit flow of the product out of the apparatus.
2. A dispensing apparatus according to claim 1 further comprising means for urging said product from said product chamber.
3. A dispensing apparatus according to claim 1 wherein said valve is a tilt valve.
4. A dispensing apparatus according to claim 1 wherein said valve comprises a mounting cup adapted to secure said valve to said container.
5. A dispensing apparatus according to claim 4 wherein said container comprises a rolled flange portion and wherein said mounting cup comprises a corresponding flange portion adapted to engage with the rolled flange portion of the container.
6. A dispensing apparatus according to claim 1 wherein said actuator portion comprises a ring member and wherein said cam surface of said actuator portion comprises at least one depression and at least one raised surface.
7. A dispensing apparatus according to claim 6 wherein said cam surface comprises two depressions arranged at opposite sides of said ring member and two raised surfaces arranged between the depressions at opposite sides of said ring member.
8. A dispensing apparatus according to claim 6 wherein said lever bearing portion is adapted to bear upon one of said

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depressions when said nozzle assembly is in the closed position and said lever bearing portion is adapted to bear upon one of said raised surfaces when the nozzle assembly is in the open position.

9. A dispensing apparatus according to any preceding claim 1 wherein said lever further comprises two lever bearing portions arranged at opposite sides of said valve.

10. A dispensing apparatus according to claim 1 wherein said nozzle assembly is provided with means to limit the rotational travel of the nozzle assembly between the closed position and the open position.

11. A dispensing apparatus according to claim 1 wherein said nozzle assembly is provided with fin members adapted to hold the lever bearing portion against the cam surface.

12. A dispensing apparatus according to claim 11 wherein one of said fin members is provided at each depression and at each raised surface of the cam surface, and wherein each one of said one or more fin member is spaced from the cam surface to allow the insertion of the lever bearing portion between said each one of said one or more fin members and the cam surface.

13. A dispensing apparatus according to claim 1 wherein said nozzle assembly comprises at least one dog tooth and wherein the hinge assembly comprises at least one slot, adapted such that said dog tooth can enter said slot only when the nozzle assembly is in the open position.

14. A dispensing apparatus according to claim 13 wherein said nozzle assembly is coupled to the valve stem for longitudinal movement, such that movement of the nozzle assembly towards the container causes the dog tooth to enter the slot and the valve stem to move, thereby opening the valve to release the product.

15. A dispensing apparatus according to claim 1 wherein said container is made from aluminium.

* * * * *

EXHIBIT C

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2 understand that?

3 A. I do.

4 Q. What do you understand that to mean?

5 A. There is a wire lever which is
6 attached at the Fulcrom to the collar.

7 Q. The next line?

8 A. A nozzle assembly sealingly
9 engageable with the hinge assembly --

10 MR. CHIN: Off the record.

11 (Recess taken.)

12 Q. Again, the next element we are going
13 to talk about is a nozzle assembly sealingly
14 engagable with the hinge assembly and let's stop
15 right there.

16 That first clause, do you understand
17 that first clause?

18 A. I do.

19 Q. What do you understand that first
20 clause to refer to?

21 A. That the components of the valve
22 engage together to allow the valve to seal.

23 Q. And how does that involve the nozzle
24 assembly and/or the hinge assembly?

25 A. It's the four components of the valve

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2 which are engaging together. You have the valve,
3 you have the hinge, you have the lever and you have
4 the nozzle and they all engage together to allow the
5 valve to function.

6 Q. And how does the -- specifically of
7 those four components, how do the two components of
8 the nozzle assembly and the hinge assembly engage
9 each other?

10 A. The nozzle assembly has an actuator
11 at the base of it upon which the hinge lies against
12 or touches, which is hinged on the fulcrom of the
13 collar and that brings the three components
14 together.

15 Q. What were the three components that
16 you received?

17 A. There is four components in total.
18 You have a valve, you have a collar, you have a
19 lever and you have a nozzle. Nozzle and actuator.
20 Sorry. And they all interrelate to each other, they
21 all engage with each other to allow the valve to
22 function.

23 Q. And you had said that the actuator
24 portion of the nozzle assembly contacts the collar?

25 A. No. The actuator portion of the

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2 valve assembly contacts the lever, the wire lever,
3 which in turn is linked at the fulcrom of the collar
4 so that when you activate the lever you put a
5 downward force on the bottom of the nozzle to open
6 the valve, which is what it's screwed onto. So all
7 four components are tenuously linked together. They
8 are actually linked together.

9 Q. Does the nozzle assembly ever
10 actually contact the hinge assembly?

11 A. Only through the lever.

12 Q. Do you understand the word
13 "engagable" to require direct contact?

14 A. No. It's optional. It's engagable.
15 It's engagable.

16 Q. I would like to direct your attention
17 to column 1 of the same patent, line 53. If you can
18 read that paragraph that starts there and the
19 paragraph would start with it says, "Preferably the
20 valve comprises." If you read that paragraph to
21 yourself and tell me if you understand that
22 paragraph.

23 A. (Witness reviewed document.)

24 Yes.

25 Q. Do you understand that paragraph?

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2 A. I do.

3 Q. Do you understand the last portion of
4 the paragraph where it talks about the flange
5 portion adapted to engage with the rolled flange
6 portion of the container?

7 A. I do.

8 Q. Does that engagement require direct
9 contact between those two elements?

10 A. Absolutely. That's what keeps the
11 valve onto the can. That's called a crimp. That
12 secures the valve to the can.

13 Q. I would like to turn your attention
14 to Column 4, Line 50. It is in the middle of this
15 paragraph where it says, "Referring again to FIGS 1
16 to 7." If you can read that paragraph.

17 A. Can I look at the drawings?

18 Q. Certainly.

19 A. (Witness reviewed document.)

20 Tell me where I am looking at.

21 Referring again, "base 90 of the nozzle." Which
22 drawing is showing it? Otherwise, I will be here
23 forever. Okay. I found it. It's on page 7
24 actually. I think it is 7A or 7F.

25 Ask the question, because I am

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2 confused.

3 Q. Do you understand that paragraph?

4 A. On first reading it, it refers to the
5 cam valve, not the screw valve.

6 Q. Okay.

7 A. Maybe I should try and read it and
8 understand it again. The drawings refer to the cam
9 valve. There is no screw on it, there is no thread
10 on it. Yes. That's what I read.

11 Q. I'm sorry. What is what you read?

12 A. It refers, in my opinion, to the cam
13 version, not the thread version.

14 Q. Taking that into account, that it
15 refers to the cam version, not the thread version,
16 do you understand what this paragraph is talking
17 about?

18 A. Yes.

19 Q. The last sentence of that paragraph
20 where it talks about "The inner surface of the
21 cylindrical extension 110 engages with a protruding
22 part 41 of the grommet 38 adjacent to the groove
23 40."

24 Do you understand that part?

25 A. Does anybody see a 40?

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2 Q. If you look at a figure 4, there is a
3 reference to 40. That might help you.

4 A. Okay.

5 Q. And I believe protruding part 41 is
6 also shown in figure 4.

7 A. Yes.

8 Q. Do you understand that first clause
9 of that sentence?

10 A. Yes.

11 Q. That engagement, is there a direct
12 contact between those two elements?

13 A. There is a direct contact between
14 what? The nozzle and the valve?

15 Q. The cylindrical extension 110 and
16 protruding part 41 of the grommet?

17 A. There is. In the cam version there
18 is.

19 Q. If you look back into column 4, that
20 line we were talking about, the last part of that
21 clause where it says, "to form a seal which prevents
22 the product passing between the valve 14 and the
23 nozzle 80." Do you understand that?

24 A. I think I do, but let me read it.
25 (Witness reviewed document.)

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2 Yes, I do understand it. It is the
3 cam version again, yes.

4 Q. What is the purpose of that seal?

5 A. The purpose of that seal for that
6 cam, nonscrewing version, was two-fold. One was to
7 apply additional resistance by compression of the
8 rubber grommet and to further improve any
9 possibilities of product seeping down between the
10 valve and the nozzle.

11 Q. So that would provide a second seal
12 to protect against any product coming from the top
13 end of the valve?

14 A. Primarily it was to urge the valve up
15 closed. This, of course, is the cam version, not
16 the thread version.

17 Q. I understand. The seal that is
18 created there had the purpose of urging the valve
19 closed?

20 A. Yeah. When you open the valve, that
21 part of the grommet which in a standard tilt action
22 valve protrudes through the mounting cap gets
23 distorted as you open it. Compresses it like
24 bellows, and that urges the valve shut when you are
25 releasing the lever. By closing it with the nozzle

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2 you compress it more like a spring.

3 Q. So the fact of enclosing the grommet
4 by the interaction of the cylindrical extension of
5 the nozzle and the grommet you are creating a more
6 springier grommet?

7 A. Yes.

8 Q. Lastly, if you turn to column 5, line
9 19, actually the paragraph I would like you to read
10 starts on Line 14 or 13 thereabouts where it says,
11 "An alternative method of sealing." If you read
12 that paragraph to yourself.

13 A. Okay. I have to look at the drawings
14 again. Yes. I am reading to -- it ends "under valve
15 stem 30."

16 Q. If you read the next sentence after
17 that, as well. That entire paragraph.

18 A. (Witness reviewed document.)

19 Yes.

20 Q. Do you understand that whole
21 paragraph?

22 A. I don't remember it, but I understand
23 it.

24 Q. The last sentence where it says, "An
25 external thread 116 is provided on the valve stem 30

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2 which engages with a corresponding internal thread
3 (not shown) on the nozzle 80 to prevent relative
4 longitudinal movement of the valve 14 and nozzle
5 80."

6 That engagement, is there direct
7 contact between those two elements?

8 A. There is a direct contact between the
9 nozzle and the valve stem, yes.

10 Q. At that engagement is there a seal
11 created?

12 A. There is a seal created, according to
13 what I read, by a seal 114 and threads.

14 Q. I would like to turn back to claims,
15 column 6. Back to that language where we were
16 discussing before where it says a nozzle assembly
17 sealingly engagable with the hinge assembly.

18 A. Yes.

19 Q. How does the nozzle engagement
20 between the nozzle assembly and the hinge assembly
21 do it in a sealingly manner?

22 MR. CANNUSCIO: Objection. Asked
23 and answered.

24 A. I think I have answered it in what I
25 described previously.

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2 Q. Your previous answer explains how it
3 does it sealingly?

4 A. Yes. It allows the valve to seal.

5 Q. Is that action of when the valve is
6 sealing, is that when the device is in operation?

7 A. You have to consider what "operation"
8 means. You mean for the customer to use it? Yes.

9 Q. When somebody first presses upon the
10 lever and the lever bears down on the nozzle
11 assembly, is that an engagement?

12 A. Well, it's an engagement through all
13 the other components, yes. It's all linked
14 together.

15 Q. Is that --

16 A. It is like a chain. A chain is
17 operational.

18 Q. Is that a sealing engagement?

19 A. It is part of the sealing process.
20 Without it you couldn't create a seal or shut or
21 open the valve.

22 Q. So when you first press down upon the
23 lever that is a sealing engagement?

24 A. It is part of the use, functionality
25 of the valve. If it remained open, the product

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2 would escape and air would get in and steal all the
3 contents so it requires to be functional. That's
4 what a valve is.

5 Q. The latter part of that clause where
6 it says, "and provided with an internal thread
7 engaged with the external thread of the --

8 A. Where?

9 Q. We are back again at the claims.

10 A. Is this the assembly sealing
11 engageable bit?

12 Q. The clause right after that. I
13 stopped you after it said "sealingly engageable with
14 the hinge assembly." I am now at the "and provided
15 with an internal thread." That language. If you
16 can read that and tell me if you understand any of
17 that.

18 A. Yes, I understand that.

19 Q. What is your understanding of that?

20 A. That the nozzle and the built-in
21 designed actuator portion of the nozzle has an
22 internal thread which screws directly onto the valve
23 stem.

24 Q. And the next claim element, and I
25 will read you the section I would like you to talk

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2 about. "The nozzle assembly being rotatable
3 relative to the hinge assembly and the lever between
4 open and closed positions of the nozzle assembly."

5 Let's stop right there. Do you
6 understand that portion?

7 A. Yes.

8 Q. What do you understand that to mean?

9 A. In this design the nozzle assembly
10 could screw around the stem and rise up the stem,
11 lifting the lever with it.

12 Q. And the next section where it says,
13 "and including an actuator portion provided with a
14 surface which cooperates with the lever bearing
15 portion such that in the open position of said
16 nozzle assembly operation of the lever causes
17 movement of the actuator portion to open the valve
18 and permit flow of the product out of the
19 apparatus."

20 Do you understand that?

21 A. I do understand that.

22 Q. What do you understand it to mean?

23 A. I understand it to be the actuator
24 portion of the nozzle, which is a horizontal
25 surface -- I think I discussed this before -- bears

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2 or has the lever bearing on it and as you unscrew it
3 the actuator portion will lift the lever hinged by
4 the collar, hinged on the collar, and allow you when
5 you depress the lever using the hinged fulcrom of
6 the collar to exert a downward force on the
7 actuator, therefore pulling the nozzle and the valve
8 or depressing the valve into the can and, therefore,
9 opening the container.

10 MR. CHIN: Please mark Exhibit 8.

11 (Defendants' Exhibit 8, document
12 bearing Bates numbers RL0538 - RL0575,
13 marked for identification, as of this date.)

14 Q. Please review the document and tell
15 me if you can identify it.

16 A. What was your question?

17 Q. Can you identify the document?

18 A. It is what it says it is.

19 "Dispensing apparatus Millennium 2 pack." There are
20 no drawings, so I would have to read it and try to
21 understand what the hell it means.

22 Q. Do you see in the upper-right hand
23 side where it says Murgitroyd & Company?

24 A. Yes.

25 Q. Who is that company?

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2 A. My patent attorney, my patent agent.

3 Q. Do you believe this to be a
4 communication from your patent agents to the
5 European Patent Office?

6 A. Yes.

7 Q. Do you believe this is in connection
8 with your European patent application that
9 corresponds with the patent in suit?

10 A. I don't know. I don't recognize the
11 numbers or anything.

12 Q. I refer your attention to the second
13 page. The paragraph that follows the words
14 "Objection" at Section 2, Paragraph 2. Would that
15 to yourself, please. That whole paragraph, where it
16 says "applicant notes."

17 A. I have read it.

18 Q. Do you understand it?

19 A. I understand it. It seems to reflect
20 the screw valve.

21 Q. Do you agree with that paragraph?

22 A. Yes.

23 Q. So you understand the words sealing
24 engagement or the description of a sealing
25 engagement between the nozzle and the hinge assembly

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2 to be describing this?

3 A. No, no.

4 MR. CANNUSCIO: Objection. You are
5 characterizing his testimony.

6 A. No.

7 Q. So what do you understand this
8 description to mean with regard to the engagement
9 between the nozzle assembly and the hinge assembly?

10 A. Just a method of locking it. It's a
11 locking method by screwing the nozzle down to the
12 mounting cup so that the nozzle was abutting next to
13 the mounting cup. You couldn't use it.

14 Q. So do you believe that that abutment
15 of the mounting cup against the nozzle describes the
16 sealing engagement between the nozzle assembly and
17 the hinge assembly?

18 A. No.

19 Q. Do you understand that this paragraph
20 makes that assertion, that that is the description?

21 A. No. I don't think it does. It is
22 not my language. To me this has to do with the
23 sealing of the valve, the locking rather of the
24 valve for transportation purposes and for shelf
25 life.

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2 Q. In the second sentence of this whole
3 paragraph it says, "The original feature referred to
4 the sealing engagement between the nozzle assembly
5 and the hinge assembly."

6 Do you understand that sentence?

7 A. No. You have to direct me to the
8 original feature they are referring to.

9 Q. Do you understand that to be the same
10 hinge assembly and nozzle assembly that's referred
11 to in the claims of the patent?

12 MR. CANNUSCIO: I am going to
13 object to this because Mr. Frutin has
14 already testified that he has no idea or
15 no understanding of whether this document
16 relates to the 064 patent, which is
17 Exhibit 1.

18 Q. Can you answer the question?

19 A. I would agree with that. I
20 understand what these simple sentences are saying,
21 but there seems to be -- I don't understand how it
22 relates to what my cam or whether it's a cam or
23 whether it's a screw patent. I understand if it is
24 a screw patent then what it says in the following
25 sentences makes sense, because you screw the nozzle

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2 down until it abuts to the mounting cup of the valve
3 for transportation so that if it was pressed down
4 during transportation the can wouldn't leak.

5 Q. Do you think that this description or
6 as you have explained it in your answer describes a
7 type of sealing engagement?

8 A. Yes.

9 Q. And that would be a sealing
10 engagement between a nozzle assembly and a hinge
11 assembly?

12 A. That would be a sealing engagement
13 inasmuch as when all the components are activated
14 together and they engage with eachother, it can be
15 used as a sealing engagement.

16 Q. What components are you referring to
17 when you say all the components?

18 A. The four components: The valve, the
19 hinge, the lever, the nozzle, all engaging together
20 to allow the can to function.

21 MR. CHIN: Please mark Exhibit 9.

22 (Defendants' Exhibit 9, document
23 bearing Bates numbers RL0613 - RL0767,
24 marked for identification, as of this date.)

25 Q. Can you identify this document?

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2 A. I do. I recognize it.

3 Q. What is it?

4 A. One of my patents.

5 Q. What is the invention of this patent?

6 A. An alternative valve, an alternative
7 can for extruding sealants.

8 Q. What do you think is the particular
9 inventive feature of this patent?

10 A. There is many.

11 Q. Can you name one?

12 A. It was a refillable can, double
13 pistons, one patent. In fact, the pistons were
14 urged to the top of the can and could be filled from
15 the top of the can. There is an issue there in how
16 you normally fill cans which I don't think you want
17 to go into, but that would be one.

18 The valve could be filled so the can
19 could be filled through the valve. It was unique
20 inasmuch as it was a plastic plug which was inserted
21 into the top of an aluminum can. This was before
22 mounting cups came on the scene. The diameter of
23 the valve was tremendous, very large. So it could
24 take very large, very thick viscous materials.
25 Probably sulfites and things that even tilt action

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2 valves couldn't take. The extrudable rate was very
3 high. It had a plastic lever.

4 Q. Does this document contain a
5 description of a container?

6 A. If it says so. I don't know. Let's
7 see if it does.

8 Q. I direct your attention to the
9 abstract. Look at the very beginning where it says
10 "abstract" and read the very first sentence.

11 A. Yes. Dispensing apparatus, yes.

12 Q. Do you believe this document
13 describes having a product chamber within that
14 container?

15 A. Yes.

16 Q. Do you believe that this document
17 describes utilizing a tilt valve?

18 A. No.

19 Q. I would like to direct your attention
20 to page 21, lines 19 through 21. Please read that
21 to yourself, that one line. Indicate to me when you
22 have read that one line?

23 A. One line did you say?

24 Q. Yes. Line 19 through 21.

25 A. Well, I've read the sentence.

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Q. Do you understand the sentence? I just want to know if you have finished reading the sentence. Do you understand the sentence?

A. I understand the sentence.

Q. Do you understand that sentence is saying that a tilt valve can be used?

A. No. I have to read the rest of the paragraph because of the context. It doesn't make sense.

Q. I understand.

A. I would like to find 226. Give me a chance.

Q. I think if you look at figure 13, that's one instance of where 226 shows.

A. Yes.

Q. Again, do you understand that this document describes using a tilt valve?

A. No, I don't think it does.

Q. Why not?

A. Because it's completely contrary to the whole design. I think what was meant there was that the standard cone that he has described, which is the top portion of an aerosol, which would normally have any kind of valve in it could be used.

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2 And I think that reference is to spray valves,
3 because spray valve is a nonsense. There is no way
4 you can put viscous materials into a spray valve for
5 reasons we discussed before.

6 Spray value with a tilt valve was a
7 way of identifying the standard cone, which is the
8 standard in the industry top of an aerosol valve
9 which could be put onto that can and then I could
10 put my assembly onto it. I don't think it tells you
11 that you can actually put a tilt action valve on an
12 aerosol spray valve on this can. That's nonsense.

13 Q. Okay. If you were not restricted to
14 viscous materials, could you put a tilt valve on it?

15 A. I don't know. This whole patent was
16 to do with viscous materials, so I couldn't tell
17 you.

18 Q. But you just testified you didn't
19 think it could because it would deal with viscous
20 materials. I'm asking if it did not deal with
21 viscous materials, could you?

22 MR. CANNUSCIO: Objection. Asked
23 and answered.

24 A. What I'm saying is that the valve
25 that I designed would not work with other than

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2 viscous materials.

3 Q. Which valve are you referring to?

4 A. This total valve here. This total.

5 Q. If you were to replace that valve
6 with a tilt valve as described in the section we're
7 talking about and you were not dealing with viscous
8 materials, is that possible?

9 A. No. You can't use a tilt action
10 valve with light weight volatile materials. That's
11 why it's nonsense.

12 Q. But accordingly for this paragraph,
13 this paragraph seems to indicate that you can use a
14 tilt valve.

15 A. No. I think it indicates that the
16 cones he was referring to, which is a standard
17 industry cone for an aerosol, which is normally
18 utilized in conjunction with standard spray valves
19 or tilt action valves is the cone that I am using
20 for my development.

21 Q. So you are thinking that when he
22 talks about the tilt valve he is only referring to
23 the cone?

24 A. He is referring to a way of defining
25 the cone, yes.

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2 Q. Is that standard in the industry to
3 refer to the valve to define the cone?

4 A. No. Because the cone itself is a
5 standard component. But as I am actually altering
6 the cone as part of this patent, he probably felt he
7 had to define what I was trying to copy. Because
8 this patent doesn't cover a cone. It covers my
9 interpretation of what a cone should do.

10 Q. So that one sentence, 19 through 21,
11 where it says a standard aerosol valve such as a
12 spray valve or tilt valve may be fitted, do you
13 believe that to be a correct statement? If it's
14 just referring to the valves.

15 MR. CANNUSCIO: Objection. It is
16 mischaracterizing his testimony.

17 A. No. It cannot work with a tilt or
18 spray valve.

19 Q. So it cannot work with a tilt or
20 spray valve. Do you believe that that sentence is
21 incorrect?

22 A. It depends what he was trying to
23 achieve. If he was trying to define the cone, no.

24 Q. Again, if he was simply just talking
25 about the types of valve and not the cone, do you

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2 believe that to be a correct statement?

3 MR. CANNUSCIO: Objection. That
4 calls for speculation.

5 Q. Do you understand it?

6 A. I understand it's calling for
7 speculation.

8 Q. So you do not understand whether this
9 sentence referring to a spray or valve or tilt valve
10 is a correct or a true statement?

11 MR. CANNUSCIO: Objection again.
12 It is mischaracterizing his testimony.

13 A. It's there to identify the cone.
14 That's what it says. What it says is what it says.

15 Q. Where does it say it is there to
16 identify the cone?

17 A. No. What it says is what it says.
18 It is saying a standard aerosol valve such as a
19 spray valve or a tilt valve, dispensing cream, et
20 cetera, may be fitted.

21 As in a standard cone is my
22 interpretation of it.

23 Q. Can you understand that that sentence
24 may not refer to identifying the standard cone?

25 A. No, because it doesn't make any sense

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2 at all. That's my point.

3 Q. Why doesn't it make any sense?

4 A. Because you can't use a spray valve
5 or a tilt action valve in that design.

6 Q. Can you use it for dispensing cream?

7 A. No. No, you can't.

8 Q. Why not?

9 A. Because this particular design, as I
10 said before, was designed for very viscous
11 formulations, polysulfides. Seriously viscous
12 materials that you can walk on and that's why the
13 port sizes and the hole down the middle is enormous.
14 If you put anything that's of a lighter viscosity in
15 there, it would just spread the ceilings.

16 Q. Do you see the sentence right above
17 that where it starts at line 17? Can you read that
18 to yourself.

19 A. Yes. Illustrates my point, I think.

20 Q. How does it illustrate your point?

21 A. The top piece, 26, is a standard open
22 top cone and may, in other embodiments, have other
23 valve assemblies fitted therein.

24 For example, standard aerosols,
25 sprays, cone, tilt action valves. It's a concept of

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2 a cone which takes other valves. Not mine.

3 Q. Correct. And do you understand the
4 combination of those two sentences to say that the
5 standard cone can have a spray valve or tilt valve
6 in it?

7 A. A standard cone can. A standard cone
8 can.

9 Q. Okay.

10 A. Can have, yes. That's describing the
11 cone.

12 Q. And --

13 A. This isn't a standard can. This is a
14 special design.

15 Q. So do you believe that a standard
16 cone cannot be utilized with this can described in
17 this patent?

18 A. Absolutely can't.

19 Q. Cannot?

20 A. Cannot.

21 Q. And it cannot because of the type of
22 material that's utilized in the can? Is that
23 correct?

24 A. It cannot for all the reasons I
25 mentioned when I said this was unique from the start

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2 to do with size, diameter, design, construction.

3 Every component that I mentioned is unavailable to
4 us if we use a standard cone.

5 Q. Do you believe that this document
6 that you are looking at right now describes a valve
7 that is adjacent to the product chamber?

8 A. Yes.

9 Q. Does that valve have a valve stem
10 that has an external thread?

11 A. Yes.

12 Q. Do you think that this document
13 describes a hinge assembly attached to the
14 container?

15 A. Yes.

16 Q. Do you believe that this document
17 describes a lever hingedly attached to the hinge
18 assembly?

19 A. Yes.

20 Q. Do you believe that that lever also
21 has a bearing portion?

22 A. Yes.

23 Q. Do you believe that this document
24 describes a nozzle assembly sealingly engagable with
25 a hinge assembly?